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CLASS BOOK
OF
BOTANY
— — —
GREEN AND CONGDON

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ANALYTICAL
CLASS-BOOK OF BOTANY,

Designed for Academies and Private Students.

IN TWO PARTS.

PART I.

ELEMENTS OF VEGETABLE STRUCTURE AND PHYSIOLOGY.

BY

FRANCES H. GREEN.

PART II.

SYSTEMATIC BOTANY:

Illustrated by a Compendious Flora of the Northern States.

BY JOSEPH W. CONGDON.

Science is only the interpreter of Nature.

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P R E F A C E .

HAVING been for several years a Teacher of Botany, I have had considerable opportunity of experimenting on the happiest means of imparting this delightful science. The importance of Pictorial Illustrations, systematically combined for regular exercises, early suggested itself. A new system of teaching was thence wrought out, consisting of a set of Diagrams made to Illustrate Oral Lessons ; and the plan was eminently successful. Those Lessons and Diagrams are reproduced in the present work, with such extension and improvements as the written form, and the superior light and progress of the times, admit and demand. The Illustrations are presented to the eye in large groups, and are either immediately, or very nearly, associated with the corresponding portions of the Text. They are designed to be used as regular exercises for study and recitation, the same as maps in Geography. They are, in fact, but a recapitulation of the text in another form ; and thus, while they repeat the idea, they also give a pleasing variety to the lessons ; and appealing from the eye to the mind, and the reverse, they awaken the most lively associations, tending to fix the impressions not only in the memory, but also in the heart.

It is a remarkable fact, that with all the beauty of flowers, and the universal love of them which prevails in the world, the Science of Flowers is one of the most unpopular—the driest and the dullest—in the common estimation—to which the attention of the student is ever called. But there can be no intrinsic necessity of this. Objects which are externally so beautiful, and which address themselves to the finest affections of the soul, must, in their internal structure, their habits, and all the relations of their beautiful life, present corresponding associations of beauty and love, whenever true and familiar views can be obtained. An attempt is made in the present series to disarm the science of at least a portion of those terrors with which it has been long invested, and to make it interesting and attractive to the *common mind*. As the love and observation of flowers are among the earliest phenomena of the mental life, so should some correct knowledge of them be among the earliest teachings. The work, then, should *begin* at home. But there should be also good COMMON-SCHOOL BOOKS, which are at once so cheap and so pleasing, that they *may*, and *WILL*, be bought and used.

The Primary Class-Book of Botany (one of the present series), is intended to supply this great want of a Common-School book, which shall be at once clear, simple, and thorough in its details, so as to render the science attractive without diluting it. It consists substantially of the FIRST PART of the Present Volume. It is unencumbered with useless technicalities and synonyms, and is so simple and direct to the point, that any Teacher of even common penetration and address can enter at once into the spirit of the lessons ; and thus, while he is teaching, be preparing himself along with the scholar, to enter the analytical course of study, should his taste incline that way.

Teachers will observe that in the references to the Illustrations, contained in the Text, the number of the Plate is given but *once* ; hence all figures are included in the one last mentioned, till *another is introduced*.

Part II., or SYSTEMATIC BOTANY, containing the FLORA, has some important points for an elementary work, among which are the simplicity and directness of the synopses, the clearness and fullness of the descriptions, the nice distinctions observed between nearly-allied species, and a very high degree of simplicity and clearness in the analyses.

To those who have a desire to cultivate their minds, but are unable to expend much time or money for the purpose, this work offers signal advantages ; for in the intervals of recreation and rest, when a heavier volume could not be attempted, this would attract and please ; and by its aid they may gratify their natural taste by attaining a competent knowledge of this charming science, with perhaps the will to pursue it further, and make themselves thorough and accomplished scholars. As it can be studied without a Teacher, it is especially intended for the Working Classes, who have hitherto been cut off from a knowledge of the science by the heaviness or abstruseness of the best systematic works on the subject. If it could only be accepted as the bearer of good tidings, it would open to the Worker treasures of thought, feeling, beauty, fairer than the pearls of the East, and richer than the beaten gold of Ophir—treasures which all the wealth of the Universe could not purchase ; for it would invest him with a transmuting power, to change the meanest objects into the most beautiful. A common weed, nay, a simple leaf, or blade of grass, would be transfigured before him—a luminous expounder of the Divine Life—radiant with gems of undying truth. Could young persons only know the value of this power they would never sigh for the frippery of fashion, the outside show, or the misnamed pleasures of the world. Let this volume, then, fulfil its mission, by scattering flowery truths in the too often waste-places of the world. Let it go to the workshop and the cotton-mill ; and the sons and daughters of Toil will find the fable of Aladdin more than realized ; for the lighted lamp of science shall unlock a world, rich beyond all human conception, with treasures of immortal life and beauty.

In closing, I would say that access to the best works on the subject has been made easy to me ; and among these I would particularly acknowledge benefits received from those of Wood, Gray, and Torrey & Gray.

F. H. G.

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ANALYTICAL CLASS-BOOK OF BOTANY.

INTRODUCTORY CHAPTER.

1. WALKING abroad in the fields, we are met on every hand by an inexhaustible variety of plants and flowers, which not only attract our attention, but call forth our affections in a very lively and peculiar manner. Their colors, their forms, their odors, excite the most agreeable sensations. These emotions, however, we have in common not only with the uncultivated of our own species, but also, to some degree, even with the lower animals. The intelligent HUMAN BEING would look for something within—something deeper, higher and truer, which is only shadowed forth in the external character—that the mind may enter into their life, and imbibe their freshness, their purity and beauty, as its own aliment.

2. Here close at hand is a little plant—(plate I. fig. 1)—a species of *Convolvulus*—which will illustrate for us this necessity. In its tiny form, simple and fragile as it appears, are contained all the wonderful secrets of Vegetable Life. It is a complete Book of Laws, written by the unerring finger of God, in the indelible lines of Truth. The Oak, whose years are numbered by centuries—the old Cypress and Baobab, whose full life may only be reckoned by ages, can exhibit nothing whose type is not already found here. It is true that this volume is written in an unknown tongue. But would you become acquainted with its language—would you call forth its interior beauties—would you penetrate its divine mysteries—come with me. Let us take each other by the hand—Teacher and Pupil—and go forth together, side by side, that we may better obey the command of Wisdom, and “consider the lilies of the field—*how they grow.*”

CHAPTER II.

BOUNDARIES DEFINED.

3. THE science of Vegetable Life is called Botany. It unfolds a knowledge of the elementary composition,

structure, habits, functions and systematic arrangement of plants, and is divided into several departments, all of which will be defined as we proceed.

4. But in order to study the plant intelligently, we should be able—at least with a considerable degree of precision—to determine *what it is*—or to distinguish it from other forms. For this purpose you will give your attention to a few simple principles, which will greatly assist us in this matter.

5. AN ORGAN is an instrument of motion, by help of which a living body is able to perform certain actions, that are hence called *organic*, or *vital*. The leaves and stems of plants, the hands, feet, and eyes of animals, are such instruments, and therefore organs. Vegetables, then, as well as animals, possess and work with these instruments; and for this reason they are called organic, or living beings; and in the whole course of study this fact must not be lost sight of—that the plant is not only a vitalized structure, but a living being—governed by vital laws.

6. MINERAL MASSES—such as Earths, Stones, and Metallic Ores, have no organs; but their substance is uniform throughout. They are hence termed *INORGANIC*, and are ranked together in one great class, which is usually denominated the Mineral Kingdom.

7. A MINERAL may be defined as *an inorganic mass of matter, endowed with a merely passive existence, and exhibiting none of the attributes or phenomena of life.*

8. Let us refer again to the small *Convolvulus*, which may be considered as the type of a perfect plant, since it has all the essential organs—roots, a stem, leaves and flowers; and we know that each of these organs performs certain offices, or functions, in its life and growth, which are essential to its development and preservation. Hence, if any of these should be removed, or greatly injured, the health of the whole plant would be affected, and perhaps its life destroyed. We know that this organism is developed from a seed, and nourished by certain substances which may properly be termed food. We know also that plants

Subject of the chapter. What is Botany? What does it unfold? What necessary to study a plant intelligently? Define Organ. Instances. Vegetables

organic—why? Inorganic bodies—describe. Collectively, what termed? Define Mineral. What facts of the plant at 8? Define Plant. Plants collectively

cannot walk about, or move themselves to and fro, at will, but are, for the most part, fixed to the spot where they first grew. Taking these facts for a basis, a *PLANT* may be defined as *an organized structure, which was derived from a parent, or parents, and exhibits the phenomena of nutrition, growth, reproduction, decay and death.* The collective family of plants is called the Vegetable Kingdom.

9. *THE ANIMAL.* In addition to the above merely vegetative functions, the animal is able to move himself about with more or less freedom, to feel emotions of pleasure and pain, and to act according to the dictates of certain impressions which are collectively called Instinct, and are a substitute for that faculty which is termed Reason in the superior intelligence.

10. An Animal is *an organized being, which was derived from parents, and exhibits the phenomena of nutrition, growth, reproduction, sensation, voluntary motion, and intelligence.* Animals collectively form the Animal Kingdom.

11. But though it is very easy to distinguish a rose from a diamond, or a butterfly from either, and to distribute them all into their respective places, yet there are points where the Animal and Vegetable Kingdoms approach each other so nearly, that their absolute boundaries are, as yet, a subject of question. We will not at present disturb these equivocal positions, but turn to the distinctions between organic and inorganic forms, which are so broad and well defined as to admit of no controversy.

12. Between Organic and Inorganic forms there are four principal differences. These are, their *mode of expansion*, their *mode of subdivision or multiplication*, their *outlines*, and their *periods of duration*.

13. *FIRST DISTINCTION.*—Minerals expand by *accretion*, or the deposition of particles on the *OUTSIDE*; They are merely *enlarged*. Living bodies are *NOURISHED BY FOOD*, which, acted upon by *internal forces*, is finally *converted into their own substance*. They *GROW*; and by this power of assimilating foreign substances, the structure is developed and sustained.

14. *SECOND DISTINCTION.*—Animals bring forth young, and plants are produced from *SEEDS*, which are young plants in an undeveloped state; but minerals are multiplied only by *mechanical subdivision*. They *never have offspring*.

15. *THIRD DISTINCTION.*—Minerals, with the exception of crystals, have no determined proportions or symmetry of outline. They generally present angular sur-

faces, and in their most regular forms are measured by straight lines. Organized beings have symmetrical forms composed of definite parts, each shape being proper to the species. They are mostly bounded by circular surfaces, and measured by curved lines.

16. *FOURTH DISTINCTION.*—Minerals have no fixed periods of duration, and their existence is indefinitely prolonged. Organized forms have an average period of life for every species.

17. *AN ORGANIZED BEING* may be defined as *one which has been unfolded through a principle of life transmitted from its parents, into certain parts, which always maintain definite relations with each other, and with the whole body. It is nourished by food. It grows until it attains to certain proportions, which, for any given species, have nearly a determined volume. It has a limited period of life; and when its vitality is greatly diminished, it DIES.* But a Mineral exhibits none of these changes.

18. Between Animal and Vegetable forms the distinctions are not so obvious, nor can they always with certainty be determined. But as only the lowest types are thus confusedly thrown together, ultimate distinctions become of comparatively small consequence. It may be sufficient here to know some of the broader lines of separation.

19. *FIRST DISTINCTION.*—Plants only are nourished by mineral food, and transform this into organic tissues. Animals universally subsist on the aliment thus transformed.

20. *SECOND DISTINCTION.*—Vegetable tissues are composed of only three chemical elements—carbon, hydrogen and oxygen. Animal tissues are composed of four—carbon, hydrogen, oxygen, and nitrogen or azote.

21. *THIRD DISTINCTION.*—In the lowest form of plants we find many species which are composed of a single cell, without any other organization whatever; but even in their lowest condition, animals exhibit a far higher degree of complexity than this, as you may learn from the observations of Ehrenberg, and other naturalists, who have studied the anatomy of rudimental tribes.

CHAPTER III.

THE PRIMITIVE CELL.

22. The science of Botany presents itself under two general aspects. First, we study plants as individuals,

their elementary composition, structure, habits, and the vital laws that govern them; and secondly, we regard them in what may be termed their social or relative conditions, as forming groups—species, genera, tribes, orders and classes. The first comprehends VEGETABLE ANATOMY, Structural and Physiological Botany, and the last Systematic Botany.

23. Under the first of these distinctions, in which Natural History becomes a kind of biography, the Plant will now be presented to your view; and if you attend to this branch of the study with a loving mind, you may safely promise yourselves a rich reward; for in nothing are plants more beautiful, more wonderful, than in their anatomical perfection, the minute elements of their organism.

24. A knowledge of the elementary composition and intimate structure of those organs of which plants are composed, is termed VEGETABLE ANATOMY. This may properly be considered the basis of the whole science, since, if we thoroughly understand the parts, we can more clearly and truly comprehend the whole.

25. Let us take up the *Convolvulus* again, and make a few more observations. At a glance we are struck with a great dissimilarity of structure in the substances of which its different organs are composed. In a single leaf we find certain soft, succulent parts, which form the expansion, or *blade*, and a fibrous portion that makes the frame-work, its stalk and veins. But these differences become more apparent and remarkable when we throw them into a stronger contrast. What could be more unlike each other than the tough wood or coarse bark of a forest tree, and the delicate petals of this little flower? In order to perceive the *reason* of these differences, we must have recourse to the Microscope.

26. FIRST FORM OF THE CELL.—Let us take a small piece of this Melon leaf, and place it so that its cut edge, or thickness, will be presented to the action of the lens (see fig. 6). We now find, instead of the plain surface that appeared to the naked eye, a collection of roundish sacs or bladders, that look somewhat like little green eggs. Of these the whole substance, except the stalk and veins, is composed; and because they are closed on all sides, like small chambers, they are called CELLS. The upper cells are seen at *u*, the lower ones at *l*; *h*, a hair; *c*, one of the canals connected with the breathing pores; *s*, spaces between the lower cells; and *f*, a bundle of fibre.

27. Here we have arrived at the basis of the whole

structure. This minute and delicate cell-work is the parent of all the vegetable tissues, from the tender floret that blooms and fades in a single day, to the heart of Oak, that only hardens with the storms of centuries; the Mushroom, that lives, and grows, and perishes in an hour; the Herb, Shrub, or Tree, whose life may be measured by months, or years, or ages, from the little Bell-flower, that blossoms at our feet, to the giant Planetree of the primeval woods, may each be traced to a common origin—in a cell-work so minute, that only by help of the microscope can we detect its presence. All these very different structures are built up of the same material. The elements are few and simple, but their combinations are infinite.

28. A plant may be considered as an assemblage of cells, out of which its whole fabric is wrought in a continuous series, like a piece of lace-work; and so simple is the mechanical arrangement, that a little child may comprehend it; while the wisdom of Sages may find subject for study in the contemplation of its vital laws.

29. APPEARANCE OF THE CELLS.—Sometimes they represent a delicate net-work, as may be seen in the pith at *a*, fig. 2, which represents a section of a woody stem. They are oblong, and flattened in the bark, as at *h h*, while at *i i* and *e e* they have nearly the same form; and because they seem to be woven, or wrought together, the different textures thus formed are called TISSUES. These in the course of growth assume various modifications, and receive different names. The primitive tissue of plants is the CELLULAR TISSUE, the component parts and combinations of which we are now to consider.

30. STRUCTURE OF THE CELL.—The walls are formed of a firm, colorless, semi-transparent membrane, and during its whole life they remain closed on all sides. The substance of this membrane is composed of carbon, hydrogen, and oxygen, and is called CELLULOSE. The inner surface of the walls is coated with a viscid, yellowish-semi-fluid substance, which, in addition to the elements of pure cellulose, has a small portion of nitrogen, the latter substance being always necessary to vital action. Here, in this inner coating of its cells, the substance of which is called PROTOPLASM, all the vital forces of the plant reside. Here are wrought all those marvellous changes, which, the more we know them, the more do they call forth our admiration and astonishment; to wit-ness, from means so few and simple, results so rich, and varied, and manifold.

Subject of the chapter. Two general aspects of the science. Plants as Individuals—study comprehends what? Plants in Groups—what? Which division have you now entered on? Define Vegetable Anatomy. Observations on the Plant. Differences observed. Microscopic observation. What

discovered? What called? Why? Parent of tissues. (27) What may a plant be considered? Appearance of the cells. Why called Tissues? Primitive Tissue. Structure of the Cell. Substance of its walls. Of their semi-fluid lining. In which is the vital action maintained?

31. FORMS OF THE CELL.—Very young plants, whatever they are destined to become, contain only the rudiments of fibre; and their whole substance may be said to consist of roundish or oval cells, as you have seen at fig. 6. But as the adjacent parts multiply and enlarge, the cells, being compressed on all sides, assume a twelve-sided form, and in the mass have the appearance of an irregular honeycomb. This is well shown in the highly magnified section of Elder pith, fig. 7. There is a great variety in the forms of the cell, and some of them are extremely elegant. When subjected to pressure on two opposite sides, they become flattened. This form universally occurs in the cells of the outside integument, or *skin*, of plants. A row of these flattened cells may be seen at the upper and under surfaces of the Melon leaf, fig. 6, and also in the bark and some other parts of the section of wood, fig. 2. Sometimes the cells assume the appearance of prisms or cylinders; here they are spindle-shaped, there they are drawn out into long tubes or flat filaments, and again they become stellate, and take the shape of beautiful little stars.

32. LIFE OF THE CELL.—The cell walls, though entirely closed, are penetrable by liquids, and through them every cell sucks up as much as it needs of the nutrient matter that surrounds it. This being acted on by the vital forces, a chemical change takes place, and a separation occurs. The nutritive portion is taken up for the nourishment and support of the tissues, while the remainder is expelled, as useless. In these acts the life of the cell essentially consists; and the life of the whole plant, which is but an aggregation of cell lives, can be but a repetition of the same processes.

33. GROWTH OF THE CELL.—The nutrient matter thus absorbed is applied to the interstices of the cell walls, which, if no obstacle intervene, extend themselves in all directions, until they reach a definite size, when they are either absorbed by new cells, or they remain permanently fixed. Having once attained to a full growth, their vitality gradually diminishes, until at length they cease to have any part in the actions of life. Each individual cell may be considered as an independent organism, having its own particular life, which it may be said to support by its own labor; and though, like the Corals, Sponges, and some higher animals, the Cells live in a community, yet each of them, so long as it exists, always maintains its own individual life, character and action, truly as any of these. ✓

34. MULTIPLICATION OF CELLS.—When the nutrient

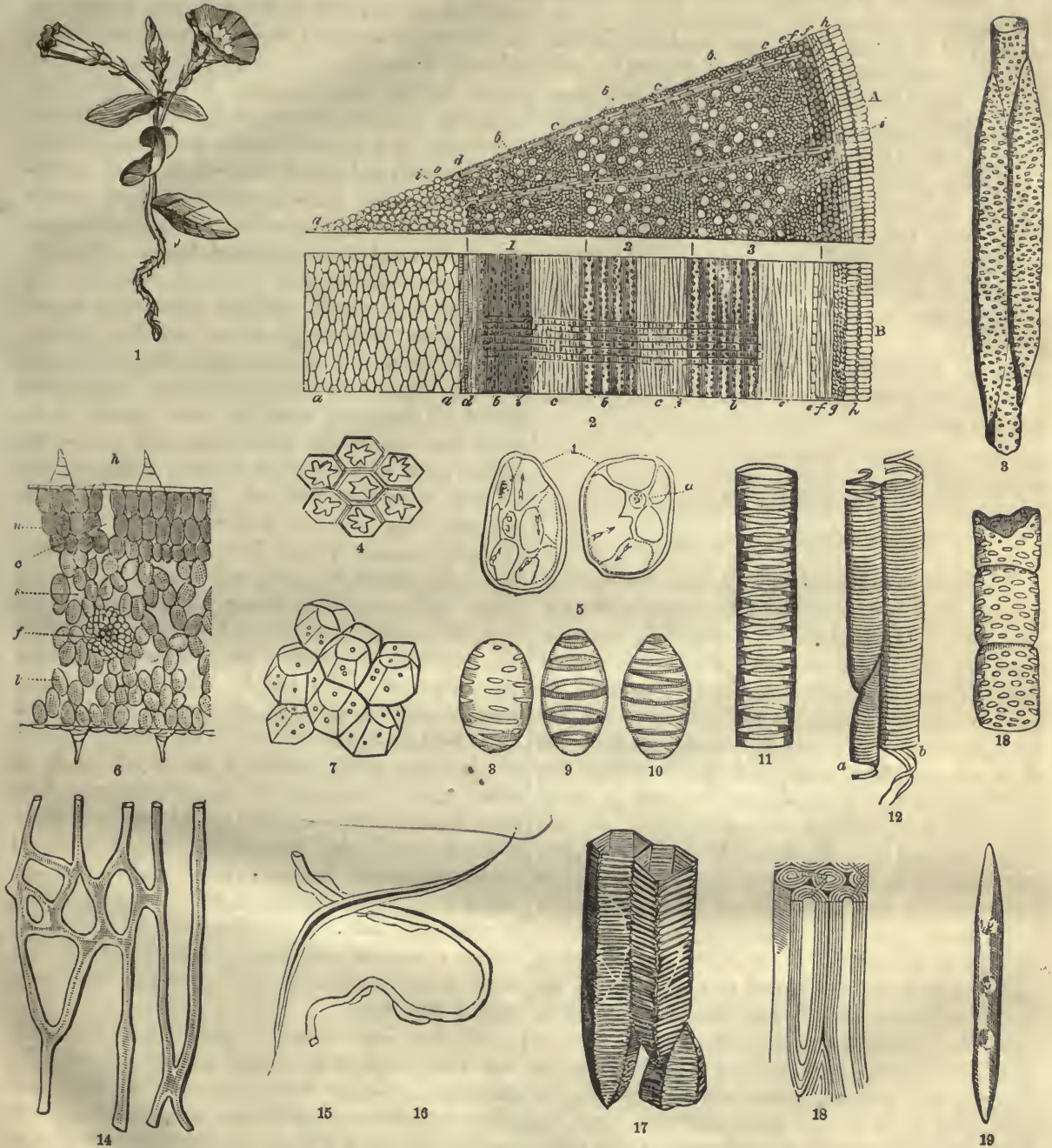
material has accumulated in a sufficient degree for the support of the new cells, they immediately begin to be formed. There are two principal modes of cell formation—first, by partitions, and secondly, by *gemmation*, or BUDDING, from the free extremity.

(1.) BY PARTITION.—The cell lining is infolded, until its extending edges meet and cohere, when a double wall of cellulose is deposited, to strengthen and sustain the new structure. Thus two, four, eight, or even a greater number of Daughter-cells are formed, while generally the Mother-cells are absorbed in the new growth; but sometimes they remain.

(2.) GEMMATION.—In this form there is a regular growing point, from which buds are protruded. Sometimes the cells thus formed are again multiplied by partition, and thus both modes are combined. Some of the microscopic plants that develop in fermenting infusions, as the Yeast plant, are said to grow by gemmation, while in many of the fresh-water plants known as Confevas, both forms are observed. The production of new cells sometimes goes on with inconceivable rapidity. This may be seen in the rapid growth of the common Mushrooms, which are composed entirely of cellular tissue. These frequently spring up and grow to the height of several inches in a single night; and in one of them it has been computed that twenty thousand new cells are formed every minute! The growth of Mushrooms, like all vegetable growth, consists entirely of a multiplication of cells.

35. PARENCHYMA.—Cellular tissue collectively is called PARENCHYMA, and sometimes it is convenient to have this distinctive term. When the cells are equally flattened on all sides, as in the pith of Elder, fig. 7, the parenchyma is COMPLETE; when they are not subjected to equal pressure, as in the Melon leaf, fig. 6, it is INCOMPLETE.

36. ORIGIN OF THE CELL.—This is not, as yet, very clearly established; but a certain little body termed the NUCLEUS is supposed to play an important part in the process, because in the structure of cells it is seen that the particles arrange themselves around this as a common centre. It is not, however, always present. In fig. 5 are represented two cells of the Snowberry, each with its nucleus, *a*. There are also various currents to be seen, either proceeding from or toward the nucleus, their direction being indicated by arrows. These currents are, without doubt, a result of the vital action in the azotized semi-fluid lining of the cell wall, by which,



General Subject of the plate. What does fig. 1 represent? Of what is it a type? Why? Name its organs. What does fig. 2 represent? Which the vertical section? The Transverse? Meaning of Transverse. How different from horizontal? Why? Vertical, how does it differ from Longitudinal? What part at *a* *f*? What in the large white dots at top? Name the successive bundle, beginning at *a*. What bundles of cells in the figure run in a vertical direction? What lines in a transverse or horizontal direction? Fig. 8, difference between it and fig. 13. What other forms of the Duct? Fig. 4. Fig. 5, at *a*.

What indicated by the arrows? Fig. 6, explain the parts. Fig. 7, describe. Figs. 8, 9 and 10, define. What does fig. 13 represent? The circular lines in the transverse section. The straight lines in the vertical. The white grooves. Fig. 19, the round spots. To what system do figs. 4, 5 and 7 belong? What figures belong exclusively to the vertical system? What to both vertical and horizontal? Which part to each? What does fig. 14 represent? 15? Is fig. 16 a vegetable product?

it will be remembered (30), all the vital forces are maintained.

37. **THE CELLULAR SYSTEM.**—The whole substance of all very young plants, the petals of flowers, the pulp of fruits, and a large portion of roots, seeds and leaves, are composed entirely of parenchyma. Also all the lower orders of plants, or all lower than the Club-mosses, as Mushrooms, Sea-weeds, Liverworts and Mosses, are made up exclusively of cells, being composed of membranous walls and the juices which they contain, or of simple cellular tissue. This, on account of its tendency to expand in a direction parallel with the plane of the horizon, as may be seen in Lichens, Sea-weeds and leaves generally, is collectively named the **HORIZONTAL SYSTEM** of plants. The mechanical basis of parenchyma is *membrane*, and the organic constituents of this are carbon, hydrogen and oxygen.



CHAPTER IV.

TRANSFORMATIONS OF THE CELLS.

38. IN the course of development, in almost all plants, many of the cells undergo some very important changes. These are chiefly caused by a thickening of the cell walls. When this occurs, a **SECONDARY DEPOSIT** is made on their inner surface. This new layer, by evaporation of the water it contains, passes into the solid state, and thus one layer within another may be formed, until the cavity of the cell is nearly or quite filled up. Sometimes this secondary deposit consists of organic material, solidified by a portion of earthy matter, as in wood; at other times it seems to be composed almost entirely of inorganic substances, as in the stone of fruits and the shell of nuts, which are nothing but cellular tissue encrusted by earthy matter.

39. The gritty tissue of the Quince is composed of cells formed in this manner, and so also is that of the Pear, fig. 4, where it will be seen that the outline of the cavity is very irregular—a circumstance which, in these cases, often occurs. Even such soft pulpy fruits as the Blueberry and Cranberry always have a portion of gritty cells, which combine with their evanescent forms and mellow juices the imperishable substance of the globe; and we know by their deposition of ashes in combustion that this is true of flowers, for the same material that

concretes in the rock and cements the mountain, is woven into the exquisite petals of the Rose, and perhaps contributes to give a mineral lustre to the almost transparent whiteness of the Lily.

40. But the most important of all these transformations is that by which **WOODY FIBRE** is developed in the system. It is this which makes the framework of the vegetable body, and corresponds with the bony skeleton of the animal form. The proper woody tissue consists of elongated cells, pointed at both ends, and overlapping each other, so as to form continuous threads. The structure of the single tubes is best shown at fig. 18. The upper part of the figure represents a transverse section, or cut *across* the wooden tubes; and the successive layers, by which the tubes are nearly filled up, are well shown, as they are also delineated by lines in the vertical portion of the figure, where the white grooves in the centre show the present extent of the calibre. But the union of wood cells in compact bundles, as they occur in the stem of trees, is best seen in fig. 2, at *c c c*. The substance of wood is called **LIGNINE**.

41. **GLANDULAR WOODY TISSUE.**—The most important modification of the proper woody tissue is that which occurs in the great Cone-bearing family, known as the Pine Tribe. The wood-cells of these trees are marked with round spots or cavities, which are more or less frequent throughout their tissue. At fig. 19 is seen a single disc-bearing cell from the wood of the Fir tree. These discs are not inclosed within the walls of a single cell, but they occupy cavities in the opposite walls of adjoining cells, which, exactly corresponding with each other, unite and leave a hollow space between. Similar discs are found in the Plane, and they are said to abound in aromatic trees. In the Yew the discs are accompanied by a very delicate spiral fibre. Glandular cells, in a petrified state, are sometimes seen in microscopic studies of mineral coal, not only showing the vegetable origin of such masses, but pointing to the Cone-bearing tribe as their source.

42. **BASS TISSUE** is the **WOODY FIBRE OF THE BARK**, and is composed of the longest cells in the vegetable structure. It is this which gives to Flax, Hemp, and all similar substances, their value in the manufacture of cordage and woven fabrics. Fig. 15 represents a very short bass-cell from the stem of Flax, lying across a cut from a fibre of silk, fig. 16. The bass-tissue is formed in the **LIBER**, or inner bark, and hence is often called the

Cellular tissue, in what tribes and parts of the plant does it prevail? What system does it form? Why so called? Mechanical basis of parenchyma. Organic constituents.

Subject of the Chapter. Secondary deposit. Where made? How formed? Examples. Gritty tissue. Instances. Most important transformation. De-

scribe Woody Tissue. What does it make? With what correspond? Lignine. Glandular Woody Tissue. Describe discs. In what tribe chiefly found? In what other trees? Discs in mineral coal—what ideas suggested? Bass Tissue. What plants produce? In what plants marked by ducts?

WOODY TISSUE OF THE LIBER. The cell walls of this tissue are generally much bent and thickened, but they rarely exhibit either dots or spiral fibre. Such markings, however, are found in the bass-cells of our common Milkweed (*Asclepias*), and also in those of the Oleander, a plant of a nearly allied order. By a knowledge of this fact, Professor Schleiden, of the University of Jena, was enabled to determine with precision what plant had produced the fibre in a bit of string that had been tied round a wine vase found in Pompeii, which proved to be our common Milkweed (*Asclepias Syriaca*). Thus indelibly are the great truths of Nature inscribed, and in so small a thing as the fibre in a bit of cord, they may be read without mistake, even after the lapse of ages.

43. DUCTS.—Sometimes an uneven thickening of the cell walls occurs, so that they become dotted, and marked in various ways. To all these varieties of tissue the general name of Ducts may appropriately be given. They are often called Vessels, and the textures which they form, the Vasiform and Vascular tissues. But these terms are very loose and improper, since the vegetable cells are not continuous tubes, like the veins and arteries of animals; but, on the contrary, they are completely isolated, like other forms of the cell, being always interrupted, at certain intervals, by closed points, and giving passage to the liquids which they receive and transmit, only through their permeable walls. There are several varieties of the duct, which may be distinguished by their different markings.

44. DOTTED DUCTS have also been termed Pitted or Vasiform Tissue. Sometimes they appear in tubes of considerable length, with their ends overlapping each other, as in fig. 3; again, they are marked by imperfect transverse partitions, which plainly show their cellular origin, as in fig. 13. Ducts are the largest tubes in the vegetable fabric, and their wide, open mouths are conspicuous, even to the naked eye, in a cross section of many kinds of wood, as the Chestnut, Oak, and Mahogany. Dotted ducts are seldom found, except in wood, and there they greatly abound, often constituting a considerable portion of its substance. Their size, as compared with the tubes of common woody tissue, may be seen in the transverse section *A a* at fig. 2, where they are represented by large white spots—the minute dots being the divided wood-cells. In the vertical section *B*, *d* indicates Spiral Ducts, *b b b* Dotted Ducts, *c c c* wood-cells, and *e f g h* various forms of cells in the bark.

In this figure, which represents a section of a woody stem of three years' growth, the successive bundles of Ducts and Wooden tubes are well shown. The letters in the transverse section, *A*, refer to the same parts. Transverse means in a cross direction, or parallel with the plane of the horizon. Longitudinal or vertical means lengthwise, or in a direction at right angles with the plane of the horizon. As these terms are in very common use through the whole study, you will do well to remember them. There are no Ducts in the Pines, and in this tribe alone is the wood composed wholly of the proper woody tissue.

45. SPIRAL DUCTS bear a general resemblance to woody tissue, but they are much longer and more delicate, being, in fact, the longest cells in the vegetable body. These very slender tubes are formed by the confluence of several cells tapering to each extremity, and having their walls strengthened by spiral fibres, which are coiled up on the inside. If you will take a stalk of Geranium or Strawberry, or almost any growing and tender leaf-stalk, and make a slight incision round, without separating the parts, and then gently draw them asunder, you will see the spiral fibre uncoiling itself, like the filaments of a fine web. Generally the spire is composed of a single fibre, as at *a* in fig. 12; often of several, and seldom of two, as at *b* in the same figure, which represents a spiral fibre from the stalk of a Melon, with the tubes at *a* overlapping each other.

46. The situation of spiral ducts is in the MEDULLARY SHEATH, or that circle of cells that immediately surrounds the pith and its ramifications, in the stem, the stalk and veins of leaves, and all parts which are modifications of leaves. They contain and transmit air, and may be seen in their true place at *d*, in the vertical section, fig. 2.

47. ANNULAR DUCTS.—Sometimes the fibre is broken into distinct rings, and these are termed ANNULAR DUCTS. They may be seen at fig. 11, where the cellular origin is well shown, by the remains of the transverse partitions. In figures 8, 9 and 10, are represented three cells marked by Dotted, Annular and Spiral Ducts.

48. SCALARIFORM DUCTS.—These abound in Ferns. They are so named because the lines or slits in the old tissue form transverse bars, like the rounds of a ladder. They may be considered as a variety of the Dotted Duct, with the dots or thin places lengthened and more equally distributed. The office of all these last forms of

In what part found? Observation of Schleiden. Ducts. By what caused? Why a better name than vessels? Dotted ducts. What sometimes called? In what part found? What wood has no ducts? Spiral Ducts, what resemble?

ble? How formed? The experiment. Where found? Contain and transmit what? Annular Ducts. What do they show? Scalariform Ducts. Why so called?

the duct is the same—they serve to convey liquids. Only the Spiral Ducts contain air.

49. PROSENCHYMA is the general name for all those tissues which are composed of elongated cells with pointed extremities, and is used to distinguish the Fibro-cellular tissue from the Membranous-cellular tissue, or parenchyma. It is the chief component of wood, to which its greatly thickened tubes, running lengthwise through the whole system, impart the high degree of strength and toughness for which that substance is remarkable. The mechanical basis of prosenchyma is *fibre*. Thus the mechanical bases of all plants, and all parts of the plant, are membrane and fibre; and the chemical constituents of these are carbon, hydrogen and oxygen. Out of these three elements, then, with a certain intermingling of earthy matter, by which a higher degree of solidity is acquired, the vegetable fabric is wholly constructed. These, with the addition of nitrogen, are termed the UNIVERSAL ORGANIC CONSTITUENTS of Plants, because no organism can be constructed without them. Nitrogen, as you have before learned (30), is one of the elements of protoplasm, and is therefore a vital agent; but it is not deposited in the structure.

50. THE VERTICAL SYSTEM.—The fibrous and tubular cells run lengthwise, and this is the reason why wood will not split *across*. The fibres themselves are stronger than the substance that binds them together. Such a disposition gives a tendency to longitudinal or upright growth, and for this reason the system which they compose is called the VERTICAL SYSTEM. It is to be distinguished from the Horizontal or Cellular System by the direction of its growth, as well as by several other features, which have already been mentioned, and with which, in due season, you will be made familiar.

51. LATICIFEROUS TISSUE.—This consists of irregular branching tubes of considerable length, which seem to have no definite connection with the other tissues. They are abundant in such plants as have a milky juice, as the Milk-weed, Celandine and Lettuce; and for this reason they are called the Vessels of the Latex, or Vessels of the Milky Juice. These tubes are so very fine and transparent, that they often elude observation, even with the help of a powerful magnifier, and that especially when they are young; but when old, and well gorged with sap, they are easily seen. At fig. 14 they are represented in a very highly magnified state. They are supposed to

occupy the intercellular spaces, and their branches are united by open mouths, so that there is a free communication throughout the whole system; and in this respect they may justly be compared with the veins of animals. The Vessels of the Latex abound in the inner bark, and also in the leaf-stalk and under side of leaves.

CHAPTER V.

CONTENTS OF THE CELLS.

52. You have now obtained some idea of the elementary processes of vegetation, in the life, growth, multiplication and transformations of the cellular tissue. You have been told how are produced from the primeval sac, or simple roundish cell, all the vast varieties of forms that distinguish the vegetable world, but you do not comprehend this. You regard it still as a great mystery, and even the language of the science has a strange and mystical, not to say severe sound. Yet with every step, as you advance, the views which you obtain will be clearer, while the terms will be more easily understood and remembered. And along with this, you will unfold a continual pleasure in the discovery of new truths, which might almost make the student wish to unlearn his science, that he may have the joy of learning it over again.

53. From the few simple elements of structure and vital action in plants (which, as you have learned, never exceed four), an almost endless variety of combinations is produced. From these four elements, carbon, hydrogen, oxygen and nitrogen, are formed substances as unlike each other as possible; such as starch, coloring matter, acids, the bitter principle, and sugar.

54. THE SAP.—The liquids which are absorbed by the roots, and pass upward through the stem, are the crude sap. This is simply water holding certain substances in solution, and is therefore inorganic. On reaching the leaves, by the peculiar action of the solar light on their green coloring matter, an important chemical action is introduced, and the character of the sap is essentially changed. It is then a thickened whitish liquid, known by the name of the MILK-SAP, ELABORATED SAP, or CAMBIUM. This liquid is the prepared material of cell structure, and is therefore an organic substance. It is carried to all parts of the system, and from it are formed the whole vegetable fabric, and all which it contains.

In what plants found? What forms of the Duct convey liquids?—what air? Prosenchyma. Mechanical basis. Mechanical bases of all plants. Their Chemical Constituents. What matter intermingled? Universal Organic Constituents. Of which is the vegetable body constructed? Which is the chief agent in vital action? Direction of tubular cells. What system do they con-

stitute? Laticiferous Tissue? What sometimes called? In what plants found? What parts of the plant?

General subject. Cheering views. Four vegetable elements—what combinations? Sap—Crude Sap—Elaborated Sap.

55. **CLASSIFICATION OF PRODUCTS.**—The peculiar secretions of plants are of two kinds—those which are composed of the elements of pure cellulose, or of carbon, hydrogen and oxygen, as Sugar, Starch, Acids and Oils, and those in which nitrogen is combined with the other three elements, as Gluten, Albumen, and the Alkaloids. The first are called **TERNARY PRODUCTS**, because they have but three elements, and the second **QUATERNARY PRODUCTS**, because they have four.

TERNARY PRODUCTS.

56. **STARCH.**—This is not only one of the most important, but also one of the most interesting and remarkable of vegetable secretions. It is a highly organized substance, as may be seen by referring to fig. 1, Plate II. which shows two well-defined starch-cells. At 6 are two distinct grains separated from the cell. Each of these grains consists of numerous layers deposited round a nucleus; but as the layers are of unequal thickness, the nucleus is not in the middle. Starch is found in every plant and every part of the plant; but it abounds in tubers, roots, seeds, and in the pith of the Sago Palms. It is an important principle of nutriment, useful in the Arts, and under the microscope exhibits the most interesting and elegant forms. A good test of the presence of starch is that it turns deep blue or violet, when moistened with a solution of iodine.

57. **DEXTRINE.**—This is a form of starch soluble in cold water. It has not only the same elements as pure cellulose, but they are combined in precisely the same proportions. In the course of growth, when there is an excess in the supply of dextrine, it is solidified, and in the form of starch is accumulated for future support. When its active presence is again called for, it is reconverted into dextrine, and being thus rendered soluble in cold water, it enters readily into the vital operations.

58. **SUGAR.**—This product, in the living plant, generally exists in solution, though it sometimes occurs in the nectaries in the form of crystals. It is abundant in all the growing parts, in pulpy fruits, sweet roots, and in the sap of the Rock-Maple and Sugar-Cane. Sugar, starch and dextrine are nearly identical; and in the vital action of plants they are repeatedly converted and reconverted into each other.

59. **MUCILAGE OF VEGETABLE JELLY** has very nearly the same composition as starch. When dry it is

tough and horny, but it swells and becomes gelatinous by the application of moisture. It is not only contained in the cells, but, in some instances, it forms a large portion of the cell wall, as in some of the Sea-weeds. In that species which is known as Carrageen Moss, the cell wall—and, in fact, the entire substance of the plant—is composed of mucilage, and to this it is indebted for its culinary celebrity, being much used in the preparation of blancmange. Mucilage is soluble in cold water, and is found in the tubers of the Orchis, the bark of Slippery Elm, the leaves of the Sassafras tree, the seed of Flax, and in the bark, roots and seeds of many other plants. It also appears as an excretion in Gum Tragacanth.

60. **ESSENTIAL OILS.**—These are generally volatile and aromatic, and thus they give to plants their peculiar odors. They are well known in their concentrated forms, which, in the hands of the druggist, are converted into essences, to be used in Medicine and Perfumery, as the Oil of Peppermint and the Oil of Orange-flowers. What is commonly known as the Spirits of Turpentine is an essential oil obtained by distillation from Turpentine—a resinous substance that exudes from Pines and other Cone-bearing trees.

61. All these substances undergo various changes on exposure to the air, by which they are converted into Resins, Gums, Wax and Balsams. Having no properties which can either nourish the plant or be instrumental in its growth, they may safely be considered as excretions. The Leaf is the only excreting organ of vegetables, and through this only liquids or gases can be exhaled. Substances, therefore, which are inclined to pass into the solid state must generally be retained in the system, but sometimes they exude directly from the surface in the form of Gums, Resins, and like substances; but they chiefly pass into the superannuated tissues, seeming especially inclined to occupy the intercellular spaces. The essential oils abound in flowers and leaves of herbs and shrubs, and the bark and fruits of aromatic trees.

62. **CAOUTCHOUC.**—This substance belongs to the same class as the next above, and like them may be termed an excretion, as it seems to have no part or office in the vegetable life and growth. It occurs in the form of minute globules, which are suspended in the milky juice of many plants in precisely the same manner as the globules of butter in animal milk. When the liquid is left undisturbed, the globules, being lighter,

Peculiar secretions. Those which are composed of the elements of cellulose. What called? Why? Those in which nitrogen is combined. What called? Why? Starch, in what plants found? What parts? Uses. Test of starch. Dextrine, difference between it and starch. What changes occur? Sugar, in what state? What plants? What parts found? What substances nearly

identical? Mucilage, what resemble? In what plants? What parts? Essential Oils, their character. Instances. What do they often become on exposure to the air? What may such substances be considered? In what plants do essential oils abound? In what parts? Caoutchouc, in what plants found?

rise to the surface and coalesce, in the same manner as those of cream, nor can they be reconverted into globules. Caoutchouc abounds in the Nettle-worts, Spurge-worts and Dog-bane tribe. Gutta Percha is a similar product of a tree of the East Indian Archipelago, and is now applied to a great variety of uses.

63. **FIXED OILS.**—In some plants, the fixed or fatty oils take the place of starch, from which they seem to be derived. They abound in the seeds of many plants, as in those of the Sunflower, Flax, Butternut and Castor-oil plant, and in the fruit of the Olive.

64. **WAX.**—This substance is nearly allied to the fixed oils. The glaucous bloom on the surface of leaves and fruits is a very thin coating of wax, which not only gives them their rich and beautiful gloss, but preserves them from injury by water. Wax is abundant on the fruit of the Bayberry, from which it may be separated by boiling in water.

65. **CHLOROPHYLLE.**—The proper sap, as you have seen (54), is wholly destitute of color; but in many cells, as in those of the leaf and flower, the heart of wood and the skin of fruits, we find a variety of brilliant and pleasing hues. These are all owing to the presence of a distinct principle, which most commonly produces green; and because it associates this most agreeable of all colors chiefly with the leaf, it is called **CHLOROPHYLLE**, or *leaf-green*. This substance consists of minute granules of irregular form, which either lie free in the cells, or loosely adhere to their walls. These granules are deposited in parts exposed to the light, which is essential to their formation, as you may see in plants that grow in the dark, for they never have green foliage. The beautiful blue of the Indigo plant is but a modification of leaf-green. In autumn, the chlorophylle undergoes important changes, and becomes red, yellow, or brown.

66. The substance of all coloring matter *not* green, as in fruits and the petals of flowers, is called **CHROMULE**.

67. **VEGETABLE ACIDS.**—The most important of these are, Malic, Citric, Tartaric and Oxalic acids. Malic acid is obtained from the juice of Apples and Pears; citric acid is found in the juice of Lemons and Oranges; tartaric acid in the Grape; and oxalic acid in almost all plants. The latter is abundant in our common Woodsorrel, and hence the name of the genus, (*Oxalis*). Prussic acid is found in the leaves, bark and kernel of the Peach, Cherry and Plum, but is most abundant in a

species of Wild Cherry (*Cerasus Serotina*). Tannin, or Tannic acid, is the astringent principle which gives to the bark of some trees, as the Oak and Hemlock, their value in tanning leather. It abounds in many old barks, and probably is a result of decomposition in the tissues.

QUATERNARY PRODUCTS.

68. **ALBUMEN.**—That substance which is interposed between the embryo and integument, in most seeds, is called the **ALBUMEN**. It is fleshy in the Cocoa-nut, tough and leathery in the Coffee, floury or farinaceous in the cereal grains, and composes almost the entire mass of many seeds. It has many of the properties of animal albumen, and however poisonous the plant may be, this part never has any noxious qualities.

69. **LEGUMINE.**—This is a highly nutritive substance, which abounds in seeds of the Bean, Pea, and other leguminous plants. It is identical with caseine, the substance which forms curds, and is the basis of cheese in animal milk.

70. **GLUTEN.**—This is a tough elastic substance, which remains after the starch is washed off in wheat flour. It exists in many grains, and in the juices of certain plants, but it is a characteristic property of Wheat and Rye, and gives to those grains their peculiar value as breadstuffs. It is the presence of gluten that gives to bread made from those grains tenacity, or that capability of swelling up, which, in culinary terms, we call being "*raised*." Gluten constitutes more than one quarter, by weight, of the best wheat flour. It is not a simple substance, but is found by analysis to be composed of albumen, fibrine, caseine and glutine.

71. The three substances last described bear an important part in vegetation, being accumulated in seeds, in order to sustain the vital operations of the Young Plant until it can work for itself.

72. In the common process of separating the bran from the flour, a large portion of the gluten is rejected, or cast away with the bran. This is clearly illustrated in fig. 4, which represents a delicate cross section from a grain of Rye very highly magnified. It may be seen at a glance that the contents of the outer cells, or those lying next the skin (which may be distinguished by its line of flattened cells) at *a*, are different from those below. These are chiefly filled with gluten, while, as you proceed downward, starch gradually takes place of

Fixed Oils, of what do they take the place? In what plants and what parts found? Wax, to what nearly allied? How diffused? Where abundant? Chlorophylle. Its effects. Meaning. Of what does it consist? What essential to their formation? Chromule. Most important Vegetable Acids. From what is Malic Acid obtained?—Citric—Tartaric—Oxalic—Prussic—Tan-

nin or Tannic Acid? Of what probably a result? Albumen, of what does it consist? What properties in poisonous plants? Legumine. In what plants? With what animal substance identical? Gluten. In what plants? What grains most especially? What property does it give to bread? What proportion in the best wheat flour? What loss of gluten?

this substance. In grinding, both of the upper layers of cells, as far as *c*, are lost with the bran, and thus by far the most nutritive portion of the grain is cast away. This shows that the millstone is not only "a bad analyzer" but a bad economist. The discovery of some more delicate process of separating the bran from the flour, or at least of extracting the gluten from the bran, so as to make it available economically, is a subject of study for the ingenious well worthy of attention.

73. ALKALOIDS.—These are possessed of the most active properties, and many of them are virulent poisons. Morphine, which is the chief anodyne principle in the Poppy; Quinine, or the bitter-tonic principle of the Peruvian Bark; Strichnine, which is the terrible poison of the Mandioc and Nux Vomica; Nicotine, the poison principle of Tobacco; and Conine, that of the Poison Hemlock, are all alkaloids.

74. CRYSTALS.—That plants contain certain earthy matters is satisfactorily shown by the deposition of ashes after burning. These are not always diffused in dismembered particles, but sometimes they occur in the form of crystals. At fig. 2 may be seen two of these crystalline clusters, from cells of the Beet. The crystals are of various forms, and are frequently needle-shaped; sometimes deposited singly, at others in bundles of several hundred together, as we see in fig. 5, which represents several cells from the Dock, two of them containing such bundles. The name of *Raphides* (a Greek word for *needles*) was originally given exclusively to crystals of this kind. It has since been extended to all such crystalline formations, though, properly speaking, the term should be restricted to such as are needle-shaped. The leaf of the Locust tree contains multitudes of crystals. They are abundant in the root of Turkey Rhubarb, and in the Old-man Cactus they constitute about two thirds of the dried tissue. In the bulbs of the Spanish Squill and Onion, the numerous crystals may easily be separated when the surrounding parts fall into decay, or by boiling.

75. SILEX.—And not only are crystals deposited in the cells, but silex, or the *earth of flints* (of which common sand is an impure condition), enters into the structure of the cell walls, thus strengthening and solidifying the simple cellulose. Were it not for this, the slender stalks of Rye, Wheat, and most other Grasses, could not support themselves in an erect position. The tribe of plants known as Horse-tails afford remarkable instances

of such depositions of earthy matter; and to this circumstance the Scouring-rush owes its value in the country, where it is sometimes used as an article for polishing metals.

76. But the most astonishing accumulation of mineral matter in the vegetable form, is found in that large class of Sea-weeds of the lowest type, which pass by insensible gradations into animal organisms. In these, almost the entire cell wall is composed of silex, which, as the plants decay, is deposited at the bottom of the waters where they are found; and thus immense strata are sometimes formed.

CHAPTER VII.

THE EPIDERMIS.

77. THE vegetable, like the animal form, is enveloped in a membranous covering called the EPIDERMIS, or *skin*. This envelope appears to the naked eye as a transparent and colorless integument, without any organic character; but on examining it through a lens, we find that it is composed of one or more layers of flattened cells. The edge of these may be seen in the straight lines of cells that bound the upper and under sides of the section of Melon leaf, fig. 17. Every part of the plant which is directly exposed to the air, except the stigma, is protected by the epidermis. The peculiar office of this very curious organ will be more distinctly treated in the anatomy of the Leaf, where it may be again referred to as its true place. At present, some of its modifications or appendages will be defined.

EPIDERMAL APPENDAGES.

78. The chief of these are, Stomata, Hairs, Stings, Prickles and Glands.

79. STOMATA.—These are orifices in the epidermis of leaves and other green parts, by means of which a communication is kept up between the external air and the intercellular spaces. At fig. 6 is a transverse section of the epidermal cells, with several oblong bodies, which are the stomata. This organ is among the most curious and wonderful contrivances in the vegetable fabric, and a more complete account of it will be introduced with the Leaf, to which it especially belongs.

80. HAIRS.—These very common appendages consist of a protrusion of the epidermal cells into distinct points,

Grain of Rye. Alkaloids, what properties? Instances. Crystals, what called? What forms? Where found? In what leaf abundant? Of what plant do they constitute a large portion? Silex, in what plants? What parts? Most remarkable instance.

Subject of the chapter. What is that? How appear to the naked eye? How under microscope? Epidermal appendages. Stomata. Where found Hairs.

more or less elongated. Sometimes they are formed by the prolongation of a single cell, as in the Cabbage, fig. 15; and at others, they consist of several cells variously united and combined. Sometimes the cells are united end to end, in a linear series, as in the Snapdragon, fig. 9, where also they are jointed. In the Marvel of Peru, fig. 7, the hair cells are strung together like beads. A unicellular hair is sometimes branched or expanded into rays, as in Alyssum. In fig. 3, at *a*, such a hair is seen, while in the transverse section, at *b*, its stellate form is more apparent. Fig. 14 represents a section of the epidermis from the Cabbage much magnified, showing full-grown hairs, and others in various stages of protrusion. The oval openings are stomata. At fig. 16 is the Garden Borrage, which is thickly invested with long and shaggy hairs.

81. PUBESCENCE is the term used to express the different kinds and degrees of *hairyness* on the surface of plants. These characters are so uniform as to be of considerable importance in specific distinctions. The surface is said to be

- (1) HISPID, when clothed with rigid hairs or bristles—
- (2) HIRSUTE, with long, coarse, spreading hairs—
- (3) PUBESCENT or downy, with soft, short hairs—
- (4) ROUGH, with short, stiff hairs—
- (5) VILLOSE, clothed with long, coarse and shaggy hairs—
- (6) TOMENTOSE, matted and entangled together in cotton-like masses, as in the Leaf of several Poplars; and
- (7) LANATE, woolly, as in the leaf of Mullen.

Many other terms are used to express different varieties of pubescence, as SILKY, VELVETY, ARACHNOID, like a spider's web, and CILIATE, fringed like an eyelash. Hairs are found on the leaf, stem, root, and almost every part of the plant. They invest many seeds, and are frequently hooked, jointed, or barbed.

82. GLANDS are epidermal appendages that contain and discharge various solids and liquids, such as oils, sugar, resins and acrid juices. Sometimes they are embedded in the substance of the leaf, causing it to appear dotted, as at fig. 12. The Lemon also has a glandular leaf. Glands are deposited in the notches of the leaf, as in the Bay-leaved Willow, or on the leaf-stalk, as in the Cherry. There is a gland at the base of the petals in the Buttercup, and a pair in those of the Crown-Imperial, fig. 11, one of which was overlooked in the delineation. Glands

are sometimes elevated on hairs, as in the Spider-wort and the Snapdragon, fig. 9. A beautiful instance of this arrangement is seen in the Sundew, fig. 10. In a state of nature, the glands give to the whole plant the appearance of being covered with little pellucid dewdrops. Such hairs are termed GLANDULAR HAIRS. The gland, instead of being borne on the summit of the hair, is sometimes fixed at the base.

83. STINGS consist of rigid, tubular hairs, fixed in a roundish glandular base, which secretes an irritating liquid. On the least disturbance of these points by the hand, the liquid which they contain is injected into the skin, and a stinging sensation ensues. The common Nettle is a familiar instance of this habit. There is a striking analogy between these and the stings of animals.

84. PRICKLES are strong and indurated protrusions of the epidermis, having a sharp point, which is often also curved, as we see in the Raspberry and the Rose, fig. 13.

85. THE INTERCELLULAR SYSTEM.—By a reference to fig. 17, you will see that there are between most of the cells, and especially those of the lower strata, certain irregular spaces, varying greatly in size and form. These constitute what is called the INTERCELLULAR SYSTEM. They are in some cases, without doubt, caused by imperfect cohesion, and are thus in some degree the effect of accident; but from the fact of their containing air, and also being connected with the stomata or breathing pores, it may be inferred that they have their fixed and essential uses in the vegetable economy. This is more apparent in aquatic plants, where often the intercellular spaces are greatly extended, and apparently constructed with as much care and nicety as any other organ. By this means, their leaves and stems are not only rendered buoyant, and kept in a floating position, but are interiorly supplied with air, which is necessary to their vital operations. An instance of this habit may be seen in the marine plant, fig. 7, Plate III. where certain portions of the stem are greatly inflated by the enlarged intercellular spaces.

CHAPTER VIII.

PROGRESSIVE DEVELOPMENT

86. By a countless multiplication of cells in a plant of the higher orders, a structure is developed composed of distinct parts or organs. You have already become

Varieties. Describe. Pubescence. When Hispid—Hirsute—Pubescent—Rough—Villose—Tomentose—Lanate? Reverse the last seven questions. When like a spider's web, what called? Like an eyelash, what? On what parts are hairs found. Glands. What contain? Where found? Instances. Elevated on hairs. Stings. Describe. Instance. What like? Prickles. In-

stances. What do the spaces between the cells constitute? With what organ connected? What contain? In what plants very large? How useful? Point them out in fig. 17.

General subject. To what does it lead?



General subject. Describe fig. 1. What at *a*?—at *b*? What the round dots near the centre? In what plants, and what parts of the plant, found? In what plants, and parts, most abundant? Fig. 2. From what plant? What other crystals represented? What are they called? Why? Fig. 3. At *a*. At *b*. To what system does it belong? What other parts and figures in the plate belong to the same system? What organ represented in fig. 6? To what two systems does it belong? In what other figure is the same organ seen? Of what do 7, 9 and 15 represent several forms? Define them. What is seen at fig. 11? How is the same organ at 10? At 12? What in figs. 13 14 15 16, 17. Define, or describe each.

acquainted with some interesting and curious phenomena in the elementary stages of Vegetable Life. Now we are to trace the development from plant to plant, beginning at the lowest, and ascending to the highest.

87. UNICELLULAR PLANTS.—When vegetation is reduced to its simplest form, we find that the cell and the plant represent each other, or, in other words, that *the cell is a complete vegetable*. This has been already foreshadowed to your mind in the philosophy of cell life and growth, where each particular cell was considered a complete organism (33). Now let us imagine one of these cells entirely detached from the parent structure, and you will have a better idea of the class of plants alluded to—for in these the cell is completely isolated, solitary in the deepest sense.

88. THE ROUNDED CELL.—In the *Protococcus*, or Red Snow, that sometimes tinges with its crimson bloom large tracts of the Polar snow-fields, we find a structure of the simplest form. Here is no organ of any determinable size, design, or form, nothing but one simple and single cell. A group of these plants is seen at fig. 1, Plate III., while on the right is an individual more highly magnified, exhibiting also a division of its contents into the new cells, which are already formed, and ready to separate from the mother-cell. The Green Snow (*Protococcus viridis*) has also the same habit and structure. These plants quickly attain their growth; the mother-cell, having given birth to a cluster of daughter-cells, decays; and thus the older tissues give place to the new, and vegetation goes on indefinitely.

89. THE BRANCHING CELL.—By another step we arrive at a branching arrangement of the cell, which, in form at least, dimly portrays the complicated organism of higher structures. Such is the *Bryopsis*, a beautiful little Seaweed (fig. 6). An Alga of still more complex structure is seen at fig. 2, with rudiments of young plants in the large globular cavity. Two of these young plants, themselves containing younger cells, are seen at the left in the same figure.

90. CELLS IN LINEAR SERIES.—Progressing step by step, we next find several cells disposed end to end, and crowned by a globular protuberance, which vaguely images the reproductive organs of higher plants; for no sooner does a plant, in its development, reach beyond a single cell, than we begin to find a distinction between the offices of vegetation and reproduction—one or more cells being especially devoted to that important office by

which the plant is to be continued, and its species preserved. But in none of the lower plants do we find a distinct set of organs for the purpose, but only specialized cells, in which the reproductive functions go on, either by a simple process of subdivision, as in the Red Snow, or by the production of other cells, but never by the elaboration of any thing like a true seed containing rudiments of the *whole plant*, as in the higher forms. In fig. 3 is seen a species of Bread-Mould. The cells are placed end to end, so as to form a kind of stalk, surmounted by the globular cells containing the young plants, which are called SPORES, and are equivalent to the seed of higher plants. They are discharged by the bursting of the sac that incloses them. Mushrooms, Moulds, and all plants resembling them, are called FUNGUS PLANTS, and they belong to the natural Order FUNGI.

91. BRANCHING SERIES.—In fig. 4 is another species of Mould, in which the spores appear as if strung together like beads, forming several branches, which are united in a cluster at the summit of the stalk. The Blue Mould, fig. 5, has a still more complex arrangement, the sporiferous branches consisting of either one or several rows of cells, forming a beautiful lacework, the whole clustering together like a flower, at the summit of the stalk.

92. THE MUSHROOM.—In the common Mushroom, fig. 12, the specialized cells form a conspicuous arch or cap, called the PILEUS, as at 1 in the same figure. The under side of this is thickly set with plates or gills, which, radiating from the centre to the circumference, bear naked spores on the summits of their cells. Lines representing these rays may be seen in the figure beneath the pileus, 1. These plants grow with wonderful rapidity. The stalk called a STIPE (at 2) is protruded from the wrapper or VOLVA, which is seen in the swelling left at the lower part of the stipe. At the left hand are two young Mushrooms, with several others, in various stages of development, about their roots, while at the right is one further advanced. The volva is bursting, and in separating from the pileus begins to discover the gills beneath.

93. FRONDLOSE FORMS.—When the cells are combined in a single plane, frondose (or leaf-like) forms are produced, as in many of the Seaweeds which collectively constitute the Order ALGÆ. Fig. 8 represents one of them—a beautiful Alga, known as the Sea-fan.

Simplest form of vegetation, describe. Rounded Cell, instances. Branching Cell, instances. Bread Mould, describe. What organs wanting in the lower plants? What take their place? How are Red-Snow and similar plants propa-

gated? What are termed Fungous plants? What order do they constitute? What are the mother-cells of the lower plants called? How discharged? Name the cap of the Mushroom—the plates underneath—the stalk—the wrapper.



What is the structure of the plants in figs. 1, 6 and 2. What does fig. 1 represent?—fig. 6?—fig. 2? Describe each. What change in figs. 3, 4, 5? Describe fig. 7. What kind of leaf at figs. 8, 9, 13, 15? Name of the stalk in fig. 12. Describe the figures, and define its other parts. Describe fig. 13. What kind of apparatus in figs. 16, 17, 19. Describe each. Describe figs. 14, 15, 20. What is the hood called? Define other parts. Explain fig. 11. What figures represent Unicellular plants? What the order Fungi?—Algae?—Lichenes?—Hepaticae?—Musci?—Filices? What kind of plants in each? How many of these, and what, develop woody fibre? What ones are completely cellular?

94. THE THALLUS.—The leaf-like body which is called a frond, in the Seaweeds and Ferns, in the Lichen, Liverwort and Mushroom tribes, takes the name of THALLUS. This, like the frond, is a confusion or blending together of leaf and stem. The bed of fibres from which mushrooms spring is called a thallus, and the same name is given to the leaf-like patches that cover old wood, walls and rocks with growths of Lichens, better known as Gray Moss. A common Lichen of our stone walls is shown at fig. 9. In this we see the spreading thallus and the specialized cells of reproduction, in various little cup-like forms, which most of us, perhaps, have noticed in the living plants of this family. They are sometimes prolonged into the form of a wine-glass, and not unfrequently are of a bright scarlet. Country children know them well, and call them *fairy-cups*.

95. CAULESCENT FORMS.—A species of Lichen, which hangs in long and tangled masses from old forest trees, especially in damp places near the coast, makes the wood appear as if hoary with age. It often exhibits the rudiments of a stem. This, however, is more distinctly attained in the Reindeer Moss, fig. 10, which in Lapland grows more than a foot in height. In seaweeds the stem is often greatly extended, sometimes attaining to more than two hundred feet in length. At fig. 7 is one of these plants, in which the stem is the leading idea of development. But this organ, like the Leaf, in all these Orders, is but imperfectly defined.

96. The Orders that have been mentioned—namely, Fungi, Algæ and Lichenes—contain plants of the Mushroom, Seaweed and Lichen tribes, which imbibe their food by all parts of their surface indiscriminately. But with the next advance, in the Liverworts (*Order Hepaticæ*), we meet with some important changes. The reproductive cells become more strongly marked, and the distinctions of leaf, stem and flower are more clearly defined. The very color shows that the leaf is attaining somewhat more nearly to its normal state, by the secretion of chlorophylle (65), and the whole structure appears greatly advanced. At fig. 13 is seen a species of Liverwort (*Marcantia*), with a stalk appearing to spring out of its spreading thallus, which somewhat resembles an Oak-leaf. At the summit of the stalk is a flower-like organ, in which the spores are contained. At the right hand corner of the thallus is a cup-form receptacle, in which small, roundish cells are deposited. By these also the plant is multiplied, and they bear a striking analogy to the buds and bulbs of higher plants.

97. REPRODUCTIVE ORGANS OF LIVERWORTS.—These in *Marcantia* distinctly shadow forth the stamens and pistils of higher forms. At fig. 17 is a highly magnified representation of the ANTHERIDIUM, or little sac containing the fertilizing spores, which it is in the act of discharging from its ruptured surface. At fig. 16 is the pistillate Sporangium, or sac containing the mother-cells of the same plant. It is surrounded by several filamentous processes, composed of cells in linear series, as at *c*. The involucre, *b*, is rounded, and swelling at the base like an ovary, while its prolongation represents a style and stigma. A very curious addition to this apparatus is seen at fig. 19, which represents one of the SPIRAL ELATERS, or elastic threads, contained in the sporangia. This appears to be a very important part of the operating forces. It has several spores, or mother-cells, attached. These spiral threads are extremely sensitive to the presence of moisture, and under its influence they expand elastically, and scatter the spores.

98. MOSSES.—In all the foregoing we find no proper roots, the fibrous portions resembling that organ being useful only in fixing the plant to the surface on which it grows; and they are produced, with almost equal freedom, from all parts of the plant. An actual epitome of the perfect plant first appears in the Mosses (*Order Musci*), which not only send up a regular stem, symmetrically clothed with leaves, but they also send down delicate little root-like processes that pierce the soil, and doubtless, to some extent, perform the proper functions of the root, by absorbing nutriment, although the plant also takes up nourishment through its whole expanded surface.

99. Here, too, the reproductive organs are distinguished by a regular apparatus of very complex structure, a superficial view of which may be seen at fig. 20, where is represented a Moss, with its leafy though not erect stem, and its fruit elevated on slender stalks. The hooded veil which covers the fruit both of Liverworts and Mosses is called a CALYPTRA. At fig. 11 the sporangia are magnified, so as to show the teeth in the calyptra, whose lid incloses the germinating cells. In the early stages of growth, the calyptra closely envelopes the sporangium; but being detached by the expansion of the inclosed tissue, it is carried upward, and forms a hood, cowl, or lid, which closes the extremity until the mother-cells are ripe for dispersion, when it opens a passage through its pores, as seen at fig. 11.

100. CELLULAR AND FIBROUS PLANTS.—All the

To what order do Seaweeds belong? Leaf of Seaweeds called what? Leaf of the Lichen, Liverwort and Mushroom tribes? What important changes are met with in the Liverworts? What is the sac of mother-cells called? Describe

Marcantia. Its reproductive apparatus. To what Order do Liverworts belong? What changes found in the Mosses? Hood of Mosses, what called? Describe. Order of the Moss tribe.

plants of the foregoing Orders—namely, Fungi, Algæ, Lichenes, Hepaticæ and Musci—are, with a few very trifling exceptions, composed entirely of cellular tissue. They produce no fibre, and form no wood.

101. FIRST DEVELOPMENT OF FIBRE.—If a plant is designed to rise beyond the very humblest height, the system must be braced and strengthened by woody fibre; and in our upward journey we first find this in the Club-Mosses, a tribe of plants immediately below the Ferns (*Filices*). These plants have a clearly defined leaf and stem. The leaves, however, are very short and scale-like, closely overlapping each other, like those of some pines, whence they are not unfrequently called Ground Pines. They are ever-green, and from their being used to decorate our houses and churches during the Christmas holidays, they always seem to have a festive air.

102. But in the proper Ferns the nutritive organs are more highly elaborated, and the distinction of leaf and stem becomes more strongly and clearly defined. But they by no means have a corresponding development in the reproductive system. This is even more simple than we find in the Mosses. At fig. 14 is a segment of the fruit-bearing frond in a common Fern, with the fruit-dots on the under side, which is exposed to view. The sporangia of this interesting family, when at a certain stage, exhibit, under the microscope, very curious movements, when they appear bursting elastically in all directions, and with very rapid motions. At fig. 15 is a barren frond of the same Fern, and at fig. 18 a fertile segment from another species. The fruit of Ferns is generally borne on the back of the leaf. Sometimes, however, the sporangia occupy transformed or smaller leaflets, situated on an intermediate part of the stem, while at others they have a stalk expressly devoted to their support, as in the flower and fruit of the higher orders. But even the tall trees into which the Ferns of the tropics often rise, are produced from spores so minute that they cannot be seen with the naked eye. Fig. 1, Plate IV., represents a Tree Fern of the East Indies, which, with its tall, tapering spire, and its cluster of fronds at the summit, appears the very symbol of grace and beauty.

CHAPTER IX.

PRIMITIVE DIVISION OF PLANTS.

103. You have seen by the late review of the lower tribes of plants, and probably also from your own observation, that in the seven families we have been considering—namely, Mushrooms, Seaweeds, Lichens, Liverworts, Mosses, Club-Mosses and Ferns—no proper flowers are produced. For this reason they are called *FLOWERLESS PLANTS*, and also *CRYPTOGAMIA* (*a concealed marriage*), because the reproductive organs are not obvious, as in the higher orders, but comparatively obscure; and for reverse reasons, the higher tribes are called *PHÆNOGAMIA*, or *FLOWERING PLANTS*. The Cryptogamia are represented by all the figures in Plate III., and the Tree-Fern and Mushroom, figs. 1 and 5, Plate IV.; and the Phænogamia, not only by the Oak and Palm, figs. 11 and 12, but also by several other more humble but not less perfect vegetable forms. The beautiful little *Pyrola*, fig. 6, with its perfectly defined root, stem, leaves and flowers, may well be called a typical plant; a fine fruiting branch of the Bitter Sweet, fig. 2; a Grass, fig. 3; and a Sedge, fig. 4, with all the vegetative organs, as well as proper fruits and flowers—all express the ultimate perfection of Use and Beauty, as developed in the vegetable system. The fruit of the Currant, the Apple and the Strawberry (the two latter exhibiting that most important feature of the higher plants—the *SEED*), show the character of the Phænogamia, and are very properly brought in here as illustrations.

104. CHIEF DISTINCTIONS.—Between these two great classes there are some very marked and important differences. The principal of these are, their Component Tissues, their mode of Vegetation, and their mode of Reproduction.

105. FIRST DISTINCTION.—The lower plants, or all those below the Club-Mosses, produce no wood or fibre, with the exception of a few spiral ducts in Liverworts, and some other trifling instances of a fibrous determination. Even in the large Seaweeds, whose fronds often vie with the most umbrageous Palm-leaves, there is, indeed, a strong framework; but its strength is derived from earthy material, and not from fibre. They are elaborations of stone, rather than of wood.

106. SECOND DISTINCTION.—In the Cryptogamia are only rudiments of the vegetative system. In the lowest tribes, the vegetative organs are confusedly

What orders are cellular plants? In what is the first development of fibre? What are they sometimes called? Order of the Fern tribe. Fruit of Ferns. Where generally borne?

General subject. What orders are called Flowerless Plants? What other

name have they? Meaning of Cryptogamia. What are the higher plants called? Chief distinctions between the two great tribes? First Distinction. Second,

mingled, and often indiscriminately represent each other. Hence there is no perfect development of either Root, Stem, or Leaf, while the functions of those organs are equally imperfect and obscure in their origin and all their action.

The Cryptogamia, as you have already seen, are produced from *spores*, and not from *seeds*, as in the higher plants.

107. **DISTINCTIONS BETWEEN SPORES AND SEEDS.**—Spores have no fixed or predetermined points of growth, but put forth from any part of their surface. They contain no embryo or organized plantlet, composed of definite parts, each of which is developed in a particular manner and direction, but they are simple cellular masses, any part of which might represent the whole. But a proper seed contains the rudiments of an organized plantlet, which, having a pre-existing form and vitality, is only *developed* in germination.

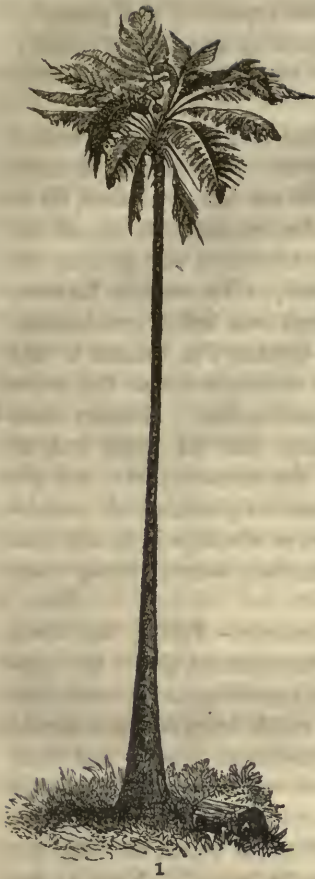
108. In the Cryptogamia, then, we find only the rudiments of special organism, whether nutritive or reproductive, which, from being undistinguishably blended in plants of a single cell, rise by fine gradations into the more perfect orders; but in none of them is there any thing like the flower of higher plants, whose parts and offices you will better understand when they are more clearly defined.

109. The Mushroom, or Fungous tribes, are almost uniformly gray or brown. Mildew, which belongs to this Order, is generally black; and though Moulds sometimes exhibit brighter colors—especially blue—and arborescent structures, which, under the microscope, reveal the most exquisite proportions and delicacy of texture—yet the very conditions in which they are produced excite disgust, rather than any ideas of beauty, at least in the common mind. Seaweeds often exhibit very bright hues, and sometimes really splendid coloring; and in size they range from plants of several hundred feet in length—some of them having enormous leaves—to thousands of species really microscopic. Liverworts are chiefly succulent, but in their green or greenish foliage is seen an imperfect delineation of the finished structure. Mosses are often delicate and beautiful, and in the plumose verdure of many Ferns there is an aerial lightness and delicacy which nothing can surpass; yet in none of them do we find that completeness of beauty which really satisfies and fills the mind. And amid all this mass of vegetation, comparatively few plants are economically valuable. They are at best rudimental series, and now preserve the transitions through which the vegetable type has passed; and whether we are seeking a high degree

of **BEAUTY** or **USE**, we shall seldom find it, except in the

110. **PHÆNOGAMIA.**—It is true that beauty exists in all things, yet the higher we rise the more completely is it unfolded—for the excellence of all the lower forms is comprehended and elaborated in the higher. And now, having reached this perfected type, we unfold all the beauty, all the riches, of the vegetable world. Do not the Rose and the Lily seem inspired with the very ultimate splendor of all inferior hues, and their lustrous petals wrought with the exquisite delicacy of a master-hand, which had wrought many ere it had made one so beautiful as these? And what is true of the Rose and Lily is true also of a thousand others. Buttercups and Daisies are free gifts of the rich and generous Earth, yet in their burnished gold and purple there is a splendor transcending the raiment of kings; and even the simplest flower that opens its blue eyes along the beaten roadside has a look of love, that should be to us an angel of blessing. The richness, and bloom, and verdure, of fruit, and flowers, and foliage—the shadowy forest paths, the sunny hill sides, and meadows spangled with a thousand blossoms, are common spectacles, and yet we never cease to feel their power, because there is an innate love of beauty in the human soul.

111. Whether we are conscious of it or not, the wealth of the Vegetable World is for ever spread out before us, and enters into the details and the sum, of all our necessities, all our enjoyments. We behold on every hand myriads of blessings, which have been figured, from ancient times, under the gifts of Flora, and Ceres, and Pomona; but in being accustomed to their uses, we forget their bounty. Mountains clothed with wood—valleys smiling with grass and corn—orchards laden with fragrant bloom in spring, and mellow fruits in autumn—fields of grain, bending beneath the riches of the coming harvest—Maize, waving its green arms, with gracious invitations to the great Thanksgiving Feast—the purple clusters of the Vine—the brown Nuts of the wood-side—Roots, stored away in the nourishing soil—the blue Flax flower, and the tufted Cotton plant—the snowy Rice, golden Wheat sheaves, and the juices of the luscious Cane, are but a few of these, and yet how wide and rich is the overflowing horn which they contribute to fill! And in all exterior forms and substances you shall find a higher beauty, a truer use, a more excellent richness, when you are imbued with the spirit of their beautiful life, so that they may unfold, and blossom, and bear fruit in the mind, for



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General subject. Name them. What figures belong to the Flowering Plants?—What to Flowerless Plants? What are Flowering Plants called? Flowerless. Describe fig. 1. What kind of leaves at summit? From what is it produced? How many, and what figures, of plants produced from *spores*?—From *seeds*? Of what do figs. 7, 8, 9 and 10, represent several forms? What important part characteristic of the higher plants seen in figs. 9 and 10? What does fig. 11 represent?—Fig. 12? How many cotyledons each.

in nothing is this inherent love of beauty more truly developed than in the study of Flowers.

CHAPTER X.

ORGANS OF VEGETATION.

112. WITH the first influence of life, the young plant is acted upon in two opposite directions. A certain point takes a downward course, fixes itself in the earth, and becomes a Root. This is the DESCENDING AXIS. The opposite point, being as strongly determined upward, rises into the air, and produces a Stem and Leaves. This is the ASCENDING AXIS, sometimes also called the Axis of Growth. These three, the Root, Stem and Leaf, are called ORGANS OF VEGETATION. They contain all that is essential to the nutriment and growth of plants, and all other organs are but repetitions or transformations of these. Each has its peculiar office in the vital economy, and yet they are so nearly related, that in certain cases the functions of one may be supplied by another.

113. Having taken a brief view of the elements of organism in the Plant, let us proceed to the History, which you will now be much better able to understand. The earliest knowledge we can have of a plant, individually considered, or as constituting a single whole, an entire being, is that of an EMBRYO contained in the SEED, and here should its biography begin.

114. THE VEGETABLE EMBRYO is of various forms, the most common being that of a club-shaped body, gashed or lobed at one end, as in fig. 4, Plate V. It consists of three parts—the Radicle, the Plumule and the Cotyledons.

115. THE RADICLE is the undivided end of the embryo, and is seen at *b*, fig. 4. This is the primary axis, from which are developed all other parts of the plant. It is the rudimental stem from which both Root and Stem proceed.

116. THE PLUMULE is the young bud which crowns the radicle, and is inclosed within the cotyledons. It contains the rudiments of the axis of growth, which, in the process of time, developes stem and leaves, with all their subdivisions, varieties and transformations.

117. THE COTYLEDONS.—The upper portion of the embryo usually consists of two foliaceous and fleshy organs, called the SEED LEAVES, or COTYLEDONS. They

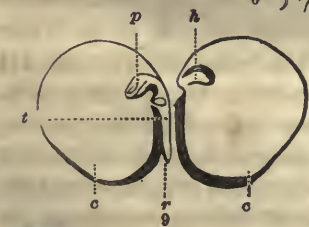
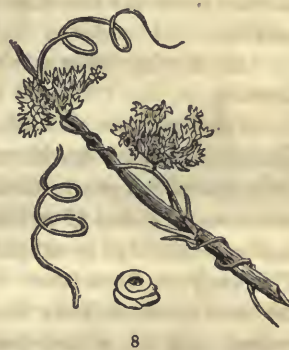
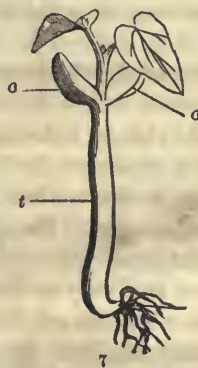
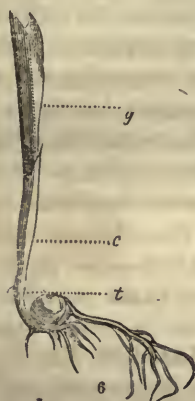
enfold the young bud before expansion, and generally rise above the surface, appearing as a pair of greatly thickened leaves, which are conspicuous in the Garden Bean, as at *c c*, fig. 7.

118. If a seed of the Garden Bean or Pea be soaked in water for a day or two, it will spontaneously or easily separate in two parts, which are the cotyledons, for in such fleshy seeds the seed-leaves constitute almost the entire bulk. Between the cotyledons will be seen the young plant, with its first pair, or PRIMORDIAL LEAVES, nicely folded, and conspicuous even before germination. At fig. 9 is a seed of the Garden Pea treated in this way. The cotyledons, *c c*, constitute almost the entire seed, being invested only with a skin. Between them the embryo is very distinct, with its young bud, or plumule, *p*, its radicle *r*, the common axis *t*, and the cavity on one side at *h*, where the plumule had been deposited. But if an oat, rye or wheat grain be subjected to the same process, no separation occurs, because there is but one cotyledon.

119. THE FIRST SUBDIVISION.—Taking the above facts into consideration, Phænogamous plants are separated into two great ranks, according to the number of their seed-leaves. Those which have *two* are termed DICOTYLEDONES, or Dicotyledonous plants; and those which have but one, MONOCOTYLEDONES, or Monocotyledonous plants. The Dicotyledones include most of our forest trees, shrubs and herbaceous plants, and they are represented in the plate by the beautiful Almond tree, fig. 2, the Garden Bean in various figures, the Moth Mullein, fig. 10, the delicate little Bell flower, fig. 17, and the Shrub, fig. 13. The Monocotyledones, which embrace the Palm, Grass and Lily tribes, are seen in the White Lily and Maize, figs. 1 and 6, in the Oat-grain, fig. 11, and in various figures of the last plate. In their mode of growth, their whole structure, and all their habits, these two great divisions present the most remarkable differences, which will be defined in a consideration of the Stem. At fig. 6 is a grain of Maize germinating: *t* is the radicle, *c* the cotyledon, and *g* the plumule, unfolding the primordial leaf, which, as all who have observed such plants know, rises above the earth like a little blade of grass. In Monocotyledones, the cotyledon never appears above ground; while in Dicotyledones, the seed-leaves rise into the air, or, in the common phrase, they “*come up*.” The Oak, and a few other plants, are exceptions, their seed-leaves never rising above the ground.

General subject. First influence of life. What is the Root sometimes called? Stem. Organs of vegetation, what contain? Earliest knowledge of a plant. Parts of the embryo. Radicle, what does it develop? Plumule. Cotyledons, character and office. What sometimes called? How many usu-

ally? In our common forest trees and herbs how many? In the Palm, Grass and Lily tribes? First great subdivision of plants, on what founded? What plants usually send up their cotyledons in germination? What exceptions? What do not? Plants with two cotyledons. Called what? With one?



General subject What is represented in fig. 4? Define its parts. What at *b*? What at *d*? What enfolded between? What figures represent Monocotyledonous plants?—Dicotyledonous?—Polycotyledonous?—Acotyledonous? Of what do figs. 15, 5, 14, 16, 3, represent several stages? Point out the parts in the figures. What does fig. 6 represent? Define its parts. Fig. 7.—Define. Fig. 9.—What at *t*, *p*, *h*, *c* or *f*? What at fig. 11? How many cotyledons? Explain fig. 11.—fig 12. In fig. 4 the cotyledons are seen in the lobed end at *d*.

120. NUMBER OF COTYLEDONS.—By far the largest portion of plants have two opposite cotyledons; a considerable number have but one; while in a single Order, containing the Cone-bearing tribe, or Pines, there are several, arranged in a whorl. This anomalous multiplication is, however, now supposed to have been produced by a division of the original or regular number of two. At fig. 12 is such a whorl of cotyledons from the Pine. At *t* is the common axis; *r* is the radicle; while between the cotyledons, *c*, may be distinguished the plumule, with its cluster of young leaves.

121. ACOTYLEDONES.—Plants that have no seed-leaves are called Acotyledones—the particle *a*, in all cases, when used as a prefix, signifying *without*. None of the Cryptogamia have any seed-leaves, consequently they are acotyledonous plants. The Cuscuta, a parasitic plant growing on Milkweeds and other herbs, and commonly called Dodder, is almost the only instance known of a plant having a regular flower, and yet being destitute of any cotyledon. It is a yellow, leafless vine, with clusters of small, white flowers, and may be seen at fig. 8, with its coiled embryo at the left, which is shown uncoiled just above, where it is seen to be entirely without seedlobes.

122. GERMINATION.—If a seed be placed in favorable conditions, it soon manifests the presence of life by a determination to *grow*. This first impulse of the life-principle in plants is called GERMINATION. The first motion observed is an extension of the Radicle downward. This soon puts forth from its lower extremity some tender little fibres, while at the same time the cotyledons expand, and the plumule, or young stem-bud, appears between them. A plant of the common Garden Bean, fig. 15, represents very happily these initial processes. At fig. 5, the young Bean plant has arrived at another stage. The roots are multiplied, and the stem begins to lengthen upward, bearing the cotyledons, which appear almost too heavy for it to carry; but they *must* be carried up, because from their substance the young plant is to be nourished until the proper leaves expand, when it will be able to provide for itself. At fig. 14 these changes are still more apparent. At fig. 16 the stem is pushing up, and already putting forth the second pair of leaves, while the cotyledons appear yet unexpanded near the roots. At fig. 3 the plant is greatly advanced; the stem is much lengthened, the primordial leaves are fully expanded, while the rudiments of another pair are seen in their axils, or at the terminating point of the stem

upward, usually denominated the Axis of Growth. The roots, meanwhile, have enlarged and increased, while among them may be seen the husk of the seed.

123. The different modes of germination, in Dicotyledones and Monocotyledones, are well shown in figs. 6 and 7; while at fig. 11 is a Monocotyledonous SEED, the Oat grain, laid open, showing the embryo, *g*, situated near the base, its radicle, *r*, and its cotyledon, *c*, rolled up like a common grass spire.

124. If the student will be at the pains to make observations for himself, he will find that his studies become more profitable and delightful. Let him remove the young seedlings every day or two, for several days, and note every point of progress. He will thus acquire many interesting and valuable particulars which never have been written in books, because, notwithstanding all the uniformity of law, the circumstances of life are so infinitely varied, that they cannot be *all* rehearsed.

125. If it were possible to do so, every point and principle should be illustrated and confirmed by an intelligent observation of natural forms. Your studies will not then be a mass of hard-sounding and abstruse terms, or of dry uninteresting facts, but they will be vitalized by the presence of Life, and exalted by familiarity with its wonderful revelations. This motto should be the beginning and end of every chapter in Science—STUDY NATURE.

CHAPTER XI.

THE DESCENDING AXIS, OR ROOT.

126. THAT part of the plant which takes a downward direction, and preferring darkness, hides itself away in the soil, is termed the Root.

127. ELEMENTARY COMPOSITION.—The chief bulk of annual and biennial roots is composed of parenchyma (35). The cells, individually considered, are subject to the same laws of life, growth and multiplication, as those of other parts; but there are some important differences in the general growth of the tissue, as will presently appear. In all plants that form woody stems, the woody tissue appears in the root soon after it begins to be established in the stem. You have observed that trees and shrubs have strong, branching roots, composed chiefly of wood, and corresponding in general with the extent and weight of the stem and branches which they are to fix and

With none? How many in the Pines? In the Dodder? In the Cryptogamia? First pair of leaves, what called? First act of life in plants, what?

First motion observed? What should be studied along with books? General subject? Define Root. Of what composed?



General subject. Parts of the root. Define. Name each figure from 1 to 6. Which is the root of trees? Which belong to Biennial?—Annual?—Perennial plants? Define and point out the Primary Root. In what figures are Adventitious Roots?—In what Aerial Roots?—In what Fibrous Roots?—In what the Fusiform Root and its varieties? What remarkable trees? Describe each.

counterpoise. If you examine the roots of any strong, hardy, herbaceous plant, you will find woody tissue, or fibre, in the same proportion which it bears to the stem. The fibrils, or growing points, are in all cases composed of parenchyma. Sometimes, but very rarely, ducts are found in the root.

128. **ORGANOGRAPHY**, or **Structural Botany**, is that branch of the science which comprehends a study of the organs as pieces of machinery, having certain relations, and adapted to certain ends. It relates chiefly to **STRUCTURE** and **FORM**.

ORGANOGRAPHY OF THE ROOT.

129. **PARTS DEFINED**.—The main body, or fleshy part of the root, is called the **CADEX**, and the fibrous portions are termed **FIBRILS**. See **ROOT FORMS**, Plate VI. That part of the root which unites it to the radicle, or base of the stem, is called the **BASE**, and sometimes also the **Crown** or **Collar**. In the hair-like processes with which most roots are abundantly clothed, all the vital forces of the organ reside.

130. **THE PRIMITIVE ROOT** is the main body of the organ, or that which proceeds directly from the radicle. It is generally branched, as may be seen by a reference to the **Root forms** just referred to.

131. **SECONDARY ROOTS**.—When any part of the stem is buried in the ground by accident, design, or the habit of the plant, it will seek to maintain its life by putting forth roots. Creeping and running stems thus buried, or in close contact with the ground, send down roots at every joint; and this is the secret of success with cuttings and layerings, that the branches thus put in the ground will strike root. Such roots, and all others which do not belong to the Primitive root or its branches, are called **SECONDARY** or **ADVENTITIOUS ROOTS**, as in the **Strawberry**, fig. 11.

132. **THE GROWING POINTS**.—The vital activities reside wholly in the *fibrils*. The growing tissue, however, is not at their extreme points, but immediately behind them. The extremities themselves consist of older tissue, which has been carried along from the base of the radicle, and combines with its insinuating points the older and firmer cells, that peculiarly adapt it for shielding the tenderer portions, by which it is continually displaced, and pushed forward in growth.

ROOT FORMS.

133. In respect to external shape, roots may be

divided into the **Branching**, **Fibrous**, **Granulated**, **Napiform**, **Fusiform**, **Premorse**, **Tuberous**, **Fascicled** and **Conical**.

134. **BRANCHING ROOTS** belong to trees and shrubs, and are of a woody structure, as in fig. 1.

135. **FIBROUS ROOTS** are found in most of our Grasses and annual plants. They are chiefly composed of fibrils, and are therefore very tenacious of life. See figs. 2, 10, 11 and 15.

136. **GRANULATED ROOTS** consist of small knobs, or tubers, strung together by fibrils, as in the **Wood Sorrel**, fig. 3.

137. **THE FUSIFORM ROOT** (*spindle-form*) is fleshy and tapering at both ends, as in the **Radish**, fig. 5.

138. **THE NAPIFORM ROOT** is a variety of the fusiform, with the caudex greatly thickened, as in the **English Turnip**, fig. 4.

139. **THE CONICAL ROOT** is also a variety of the fusiform, and is distinguished by its tapering regularly from the base to the apex, as in the **Carrot**, fig. 9.

140. **THE TUBEROUS ROOT** consists of one or more fleshy knobs, or tubers, united at their base by fibrils, as in the **Orchis**, fig. 8. This form must not be confounded with the **Taber**, such as the **Potato**, which belongs to stem forms.

141. **THE PREMORSE ROOT** is an abbreviated conical root, appearing as if cut or bitten off at the lower extremity, as in the **Devil's Bit**, a European plant (fig. 6), which was named from this circumstance. The common **Birdfoot Violet** of our wood-sides is also a good example.

142. **THE FASCICLED** (*bundled*) Root seems to consist of an inordinate growth or swelling of the principal divisions of a fibrous root into a number of fleshy processes, as in the **Early Crowfoot**, the **Peony** and the **Dahlia**, fig. 7. A variety of this form develops into five hand-like divisions, and is hence called **PALMATE**.

PERIODS OF DURATION.

143. In respect to their continuance, roots may be divided into **ANNUAL**, **BIENNIAL** and **PERENNIAL**.

144. **ANNUAL ROOTS**.—These belong to such plants as spring from the seed, arrive at maturity, flower, and bear seed in their turn, all in the course of one season.

145. Such roots are always fibrous, as may be seen in the **Convolvulus**, fig. 10, in **Barley**, **Oats**, and many common herbs and weeds of our gardens and kitchen doors. They are only adapted to absorption; and in the rapidity of their vital movements, the nutriment is ex-

In what proportion is wood formed? Define **Organography**. Parts of the Root. Define **Caudex**. **Fibrils**. **Primitive Roots**. **Secondary**. Which parts vitally active? Growing tissue, where deposited? **Root Forms**. Define the

Branching, **Fibrous**, **Granulated**, **Fusiform**, **Napiform**, **Conical**, **Tuberous**, **Premorse**, **Fascicled**. **Duration of Roots**.

pended nearly as fast as it is collected. Only enough is laid by to sustain the process of flowering, and when that is over, the plant dies from mere exhaustion.

146. **BIENNIAL ROOTS.**—These in the first season merely put forth a tuft of leaves; and all the extra nourishment which the roots absorb is stored away in the large, fleshy knobs, tubers, or other receptacles, that always distinguish such roots. This is generally in the form of sugar, starch, or mucilage. In the second year's growth, the plant clothes itself with a stem and leaves, flowers, and ripens seed. These processes are almost entirely maintained by the accumulation of the previous year; and thus the root, having no further supply, becomes exhausted, and dies. The Beet, Carrot, Radish, and most of our esculent roots, belong to this class.

147. **PERENNIAL ROOTS.**—All trees and shrubs, and many herbaceous plants, have perennial roots, or such as live and grow many years. Those belonging to arborescent and shrubby plants are *woody*, and, like the stem in such growths, they have but a very small portion of their tissue in an active state at any given time. The wood is formed in the same manner as that of the stem, but it has no part in the proper office or functions of the root, which are vested entirely in the fibrils. These last are, in all cases, temporary, either existing only in the youth of the tissues which they clothe, or at most to the end of the growing season. But they are always renewed in the young and vigorous parts, and wake with the waking season, to the fulfilment of their proper work.

148. **HERBACEOUS STEMS**—even those of our perennial herbs—are always strictly *annual*; for since they cannot endure the severe cold of the winter, in temperate climates, they die down to the ground with the coming of frost; while the perennial roots, with their latent juices, remain closely enveloped in their earth-mantle, until Spring returns and calls them forth, when they send up new stems, and appear with all the freshness of a new life. Thus year after year renewed, they continue to put forth yearly their new stems, crowned with new flowers and fruit. For this reason, small, shrubby perennial stems, on being acclimated at the North, change their habit, and become annual. Thus the Nasturtion, which is a perennial shrub in Peru, where it is a native, in our climate becomes an herbaceous annual.

CHAPTER XII.

SOURCES OF NUTRIMENT.

149. **THE ROOT**, in its normal position, may be considered as fixed in the soil, but it is occasionally found floating at large in water, as in the Duck-weed, and many Sea plants. Sometimes also it germinates without coming in contact with either earth or water, and continues to maintain its life in the open air. Again, it will strike into the tissue of other plants, and live on the assimilated material which it there finds.

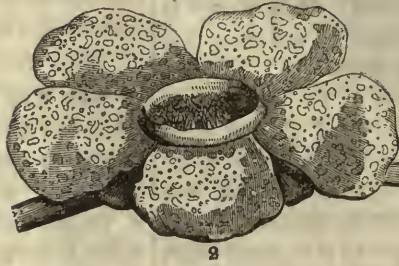
150. **Roots that live in the water are called AQUATIC ROOTS**; those which shoot in the air, **AERIAL ROOTS**; those which live on other plants, **PARASITIC ROOTS**; and those which are used merely as mechanical support, to fix the plant to the surface on which it grows, **EPHYTIC ROOTS**.

151. **AQUATIC ROOTS** are generally distinguished by very numerous, long, slender fibres, the use of which is apparent; for, living in a rarer medium than the soil affords, they thus present a much greater extent of surface to the surrounding element, and the means of obtaining food are thus multiplied. Sometimes these roots are quite free, and float at large, as in the Water Chick-weed; at other times they send down long processes, and establish a connection with the soil, as in the White Pond Lily.

152. **AERIAL ROOTS.**—These are sent forth by the stem at a distance from the ground, which they finally reach and penetrate. The Mangrove, inhabiting the low marshes which form the shores along the mouths of most of the large tropical rivers, is able to sustain itself in its unstable position by its strong aerial roots. These are sent forth from different heights on the stem; and after reaching the ground they establish themselves, and form a kind of frame-work, on which the tree stands, securely braced by the interlacing of its woody fibre with the roots and fibres among which it is established, while at the same time the water obtains a free passage through the lattice-work thus formed. These roots are natural layers, and again send forth stems, and thus whole forests are produced. This tree is represented at fig. 13, but not very perfectly, for the aerial roots which it drops down from the branches, as well as the main stem, are not prolonged sufficiently to be conspicuous, nor are their gradations preserved. In the Screw Pine (*Pandanus*) we find the same habit, which is quite as admirably adapted to its condition, as you will see at fig. 12, where



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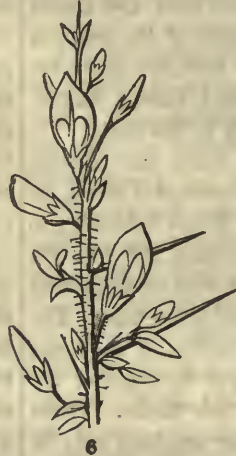
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General subject. What is shown at fig. 1? Define its two kinds of root, and the uses of each? What at fig. 2—fig. 3—fig. 4? What part is to be observed? How are the Tendrils at fig. 7—fig. 8? What at fig. 5, and what does it prove—fig. 6? What does fig. 11 represent? Point out the Nodes—the Inter-

nodes. In respect to *position* how are the buds at fig. 11—how at fig. 10? From which of these does the main Stem develop? From which the Branches? How are the branches at fig. 9?

the aerial roots are striking out from every part of the main stem almost to its summit.

153. THE BANIAN.—But the most remarkable instance of this habit is found in the Banian, or Indian Fig of the East, fig. 14. This tree sends out long, horizontal arms, and from these drop down the aerial roots, lengthening until they reach the soil, where they finally establish themselves, put forth other stems, and send down other roots, until the parent tree, surrounded by numerous trunks almost vying with itself, becomes a grove, and thus the multiplication of trunks goes on indefinitely. But the Banian tree can neither be described nor delineated as it appears in life, with its expansive canopy of branches—a beautiful green temple of a thousand pillars, curtained with the glossy clusters of its shining leaves.

154. PARASITIC ROOTS.—These are a variety of aerial roots that shoot forth in the air; but instead of reaching the soil, they attach themselves to other plants, from which they derive their nourishment. They may be divided into two classes—GREEN PARASITES, and PALE or COLORED PARASITES.

155. GREEN PARASITES are furnished with digestive organs of their own, and are, in fact, *not wholly* parasitic, because they perform, in their own tissues, a part of the vital action necessary to their support. The Mistletoe is an example. This shrub unites itself so perfectly with the Foster-plant as to appear a natural branch. Creeping and twining parasites abound in tropical forests, where they often crush to death the trees which they enfold.

156. PALE PARASITES have no green foliage, and consequently no digestive apparatus. Hence they must live entirely at the expense of the Foster-plant. This will be better understood when you become acquainted with the functions of the Leaf. The English Dodder, Plate VII. fig. 3, is a pale parasite, and is well represented, showing the suckers at the end of the stalk, by which it adheres to the herbs, on whose elaborated juices it feeds and grows. Our common Dodder is a beautiful little plant, notwithstanding its habit. Its profuse clusters of white flowers look as if they were strung together with numerous threads of gold-colored silk. The clustered flowers of Beech-drops, and the curious Indian Pipes (*Monotropa*), which are parasitic on the roots of old trees, or among decaying herbage, belong to this class. The *Monotropa*, in its whole substance—leaf, stem and flower—when fresh, has the appearance of pure white wax. The leaves are reduced to mere scales,

and the close resemblance which its shape bears to a tobacco pipe has suggested the name.

157. ONE-FLOWERED PARASITES.—Sometimes the parasite is reduced to a single flower, seated directly on the Foster-plant. Such is the *Rafflesia*, fig. 2. This, although a parasite, is the largest flower known. It is truly the Mastodon of Flowers. It measures from eight to ten feet in circumference, and weighs fifteen pounds; while the cup in the centre will contain eight quarts, English measure. This flower is of a brick-red, inclining to orange, marked with white spots. It is parasitic on a species of Grape-vine, and is found in Sumatra.

158. EPIPHYTIC ROOTS.—These are useful merely in their mechanical support. The root-like processes by which the Ivy ascends, and the Trumpet vine sustains itself in the air, are properly epiphytic, though they are not usually called so; and this is true of all root-like processes which serve merely for mechanical support.

159. AIR PLANTS.—But epiphytic roots chiefly distinguish a peculiar class of plants that are called EPIPHYTES, because they grow on other plants, and AIR-PLANTS, because they derive their nourishment from the atmosphere. They generally grow on the trunks and branches of trees, to which the epiphytic roots adhere merely for support, their true roots being free, and hanging loose in the air. Many of the tropical Orchids are of this kind. They are greatly prized by Florists, not only for their beauty, but for their fantastic varieties of form and color, which give them a wonderful likeness to butterflies, and other bright-hued insects. One of their forms may be seen at fig. 1, and also their free roots shooting out into the air. The *Tillandsia*, or long Gray Moss that grows so profusely on the Live-Oak, Cottonwood, and other trees of the South, is a plant of this kind.

160. VEGETABLE PHYSIOLOGY is that branch of the science, which comprehends a knowledge and observation of the organic machinery, *as endowed with life, and manifest in action*. It relates chiefly to VITAL HABITS AND FUNCTION.

CHAPTER XIII.

PHYSIOLOGY OF THE ROOT.

161. THIS organ does not, like the stem, grow by an extension of its whole length, but by the extremities alone, as you have already been apprised (129); and this mode of growth is well adapted to the circumstances

parasites? Why? Instances of Green Parasites. Pale Parasites. One-flowered parasites. Describe Epiphytic Roots. Air plants. Instances.

Parasitic Roots. What varieties? How distinguished? Which perfect

in which it is placed. The Stem, for the most part, develops in the open air, and in that free element elongates without interruption through its whole extent; while the Root, living in a denser medium, must have a corresponding difference of habit. Instead of projecting forward its whole length, it insinuates itself, point by point; and as if Caution had been a natural companion of the Darkness, it thus creeps along, opening a way, and finding a space for itself, which otherwise it could not attain. By this method, also, it is able to avoid any obstacle, by winding round it. But if it grew like the stem by a uniform projection of its whole substance, the vital elements would be arrested in their flow, by every obstacle with which any portion of the growing part might come in contact. The active juices thus thrown back, would accumulate; the growth would only develop swellings and contortions; repeated deformities would occur; and the symmetry of the plant, and perhaps its health also would be destroyed. But the Wisdom that leadeth the little lambs on the hill-side guideth the Root as well; and thus led it never goes astray in the dark.

FUNCTIONS OF THE ROOT.

162. Mechanical fixture, by which it maintains and counterbalances the superincumbent stem and branches, is the first, and most obvious function of the Root. But if you examine closely, you will find that it has also other offices, which may properly be termed vital. The most important of these is

163. ABSORPTION—or the power of sucking from the soil the liquids and gases which are essential to the life of the plant. This office is performed chiefly, if not entirely, by the fibrils, or small hair-like processes with which the root is abundantly clothed. These parts, having no epidermis at their extremities, absorb liquids with a great deal of power, until the root is completely saturated with moisture from the surrounding soil (164). The way in which this force operates was long a subject of much doubt and mystery. The ascent of the sap is directly contrary to gravitation; and thus one of the highest laws of Nature was supposed to be contravened by the Vegetable Economy. The theory of capillary attraction was objectionable, because there are no continuous tubes in the vegetable frame, but only closed cells, and short, interrupted passages. Yet these very cells, closed by membrane, are now found to combine all the circumstances necessary to a maintenance of that

mode of circulation which was discovered by Dutrochet, and is termed ENDOSMOSE and EXOSMOSE. This, being at present the accepted theory, and one which, as far as it goes, satisfactorily accounts for one of the most remarkable and important processes in Nature, something should be known about it.

165. THEORY EXPLAINED.—Two liquids of different densities separated by a membrane, attract each other, and currents will be established between them; but that from the denser to the weaker liquid will be strongest, in proportion to the difference of density between the two. The principal current is called ENDOSMOSE, or *inward flowing*, the other EXOSMOSE, or *outward flowing*.

166. THE EXPERIMENT.—Immerse a bladder partly filled with milk, or a weak solution of sugar, in a vessel of pure water, and the bladder will be gradually filled, by the action of endosmose; while at the same time the water in the vessel will be slightly sweetened, or whitened, by a transudation of the denser liquid, through exosmose. If a glass tube having the lower end closed with membrane be used, you can witness the progress of the experiment.

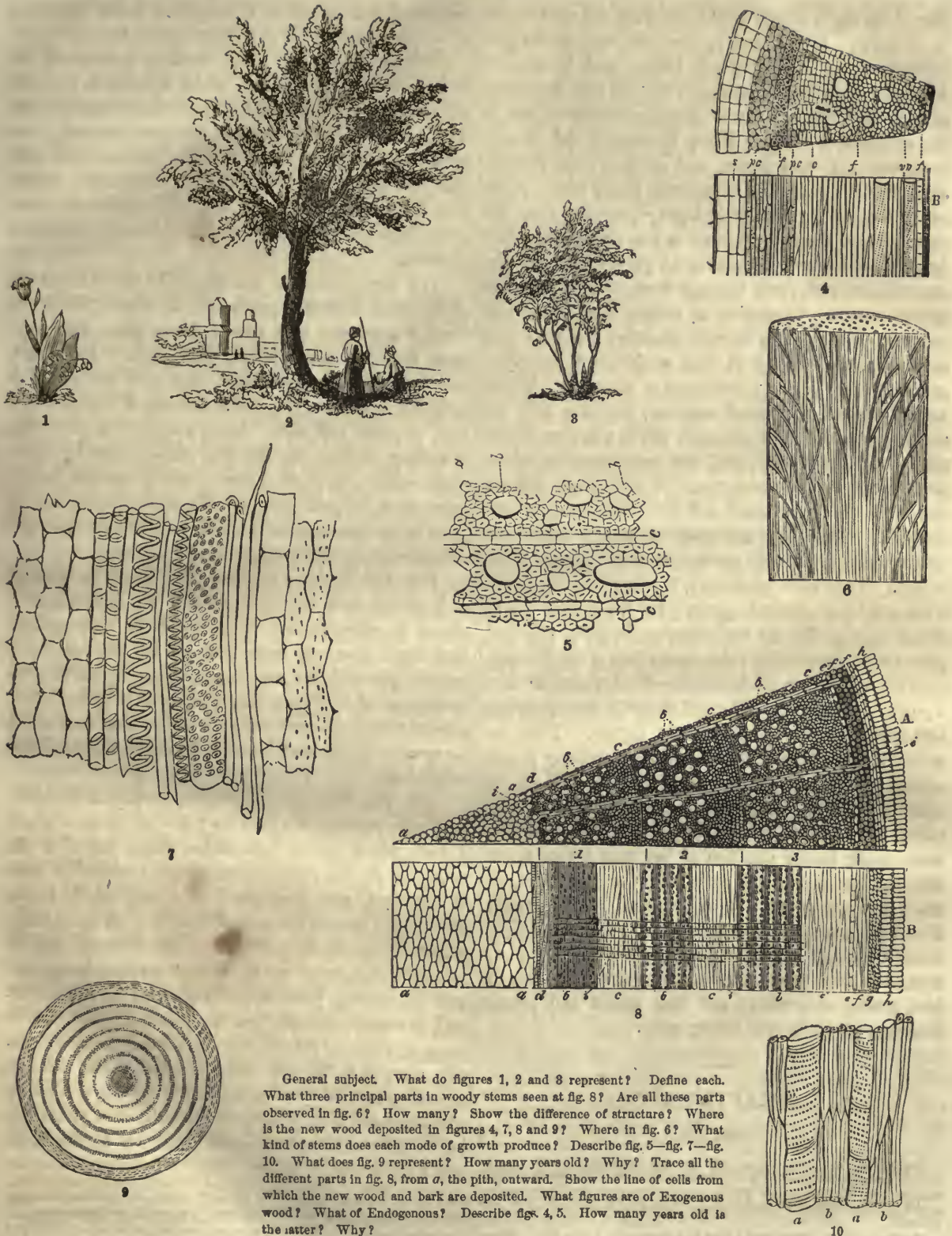
167. APPLICATION.—The vegetable cells are the tubes closed with membrane—cellulose—which, it will be remembered, is permeable by liquids (32). These contain assimilated juices, which, being mingled with the crude sap, or lymph, render it more dense than the water on the outside of their walls, which being attracted toward the denser liquid by this law that always tends to equilibrium of densities, flows inward—and this is Endosmose.

168. But that the counter-current, Exosmose is also established, is clearly shown by two facts. First, a plant grown in water always imparts some of its peculiar properties to the liquid which it inhabits; and secondly, we find by a careful analysis of the soil round any plant, that the earth is more or less impregnated with its peculiar properties, neither of which could be if the liquids of the plant did not flow outward.

169. But though all this is, almost beyond a doubt, true, there is yet a higher truth that should not be lost sight of. The Vital Principle is still, and ever must be, superior to merely mechanical laws; and to a considerable extent holds them in obedience to itself. Dutrochet considered Galvanism as the agent of transmission; and probably there are several agencies concerned. The

Leading subject. Define Physiology. To what does it chiefly relate? How does the Stem grow? The Root? Reason of the difference. If it grew like the stem, what would happen? First and most obvious function of the Root? Most important function? By what organs chiefly maintained? Theory of

Capillary attraction, why objectionable? Theory now generally adopted, called what? Explain. Meaning of Endosmose? Exosmose? Describe experiment. Application. What force superior to the mechanical? What forces probably assist the operation? Dutrochet considered the agent of transmission what?



General subject. What do figures 1, 2 and 8 represent? Define each. What three principal parts in woody stems seen at fig. 8? Are all these parts observed in fig. 6? How many? Show the difference of structure? Where is the new wood deposited in figures 4, 7, 8 and 9? Where in fig. 6? What kind of stems does each mode of growth produce? Describe fig. 5—fig. 7—fig. 10. What does fig. 9 represent? How many years old? Why? Trace all the different parts in fig. 8, from *a*, the pith, outward. Show the line of cells from which the new wood and bark are deposited. What figures are of Exogenous wood? What of Endogenous? Describe figs. 4, 5. How many years old is the latter? Why?

flow of the sap is always most rapid when the vital action is strongest. In the spring, when the buds of the previous year are expanding into leaves; and in summer when the buds for the coming year are just beginning to be formed, there is a strong determination of sap to the extremities. Light, Heat, Electricity and Winds, accelerate the vital forces, and produce some remarkable effects, which they could only do by virtue of the existing vitality; and it is highly probable that the circulation of the fluids is more or less strongly impelled by all these forces. Light exerts a powerful influence on the leaves directly, and through them, indirectly, on the whole system. Vegetation is always more rapid and powerful in warm than in cold climates; and it is said that no natural degree of heat would prove injurious, provided there is also a sufficiency of moisture. Winds not only afford mechanical exercise; but they lave the whole system in fresh currents, which are thus driven through the pores of the leaf, and carry electrical stimulants into the whole circulation. When a plant dies the flow of the sap is restrained, and the Endosmose is at once arrested. Thus you see that no merely mechanical agency can satisfactorily account for the actions of living beings. They have machinery, it is true, and this must be moved by mechanical agency; but the MOVING POWER stands back of all; for the structure, in being vitalized, passes away from under the common laws of dead matter.

170. CHOICE OF NUTRIMENT.—That plants do have a power of selection, or a kind of choice in the substances that surround them, is absolutely certain. From the self-same soil a Beet-root, or Potato, will take up potash, a Clover-plant lime, and Wheat, phosphoric acid for the elaboration of its seed, and silex for the support of its stalk. It has also been observed that roots lengthen most rapidly in the direction of the most favorable conditions, thus appearing to seek, by a kind of instinct, the water and gases that are to be found in richer soils. But the idea of their being governed by instinctive preferences is now wholly exploded. We can easily see that they must grow most rapidly where they find the best means of growth; and thus literal and prosaic Science very coolly sets Poetry aside.

CHAPTER XIV.

THE BUD.

171. A tree should not be considered as a single

Do plants choose their food? Is it an instinctive process? How explained?

Leading subject. What may a Tree be considered? Define Bud. Where

individual, but rather as a compound being, consisting of as many individuals as it may contain buds.

172. *A Bud is a scaly envelope containing the rudiments of a new plant, which it holds in a latent state, until circumstances favor their development.* At figs. 10 and 11 are different forms of the bud. The trees and shrubs of warm climates do not form scaly buds, but unfold their leaves directly to the air. Whenever there is snow a part of the year, and severe frosts occur, buds are produced for the protection of the latent plantlets.

173. STRUCTURE OF THE BUD.—In this is found one of the most beautiful provisions of life. The young Plant is enveloped in a coat of downy fibre, with layer upon layer, to make it soft and warm. Its roof is thatched with stronger folds; and over the whole is spread a coat of resin, which renders it impenetrable both to cold and wet. Thus wrapped in its silken swaddling clothes, the Plantlet sleeps securely in its warm retreat, until the latent power is excited, and it comes forth to join the troop of dancing leaves, and rejoice in the greenness of Spring—or perhaps to assert its individuality by the assumption of a new life.

174. The Embryo Plant remains latent in the bud, as it often does in the seed, and will not grow till it is placed in circumstances favorable to its development. But that it *does* exist in the bud, and has the capacity of unfolding itself into a new plant, is shown by the familiar operations of Grafting, Layering, and Budding, which consist simply of transferring the bud to conditions where its specific vitality may be excited, and its individual life called forth.

175. The Plumule, or ascending portion of the stem, originally consists of a growing point, or, in other words, a *bud*, which, in its undeveloped state, exists in the embryo. By the development of this a section of stem is produced, still terminated by a bud, which always finishes and crowns the annual growth. In some trees, as the White Birch and Cherry, the primary axis, or principal stem, continues to maintain its ascendancy; and with its aspiring point annually crowned by a new leaf-bud, it remains distinct from the branches. But in most cases, by repeated ramifications, it becomes indistinguishably merged in its own offshoots; and at the summit several points of about equal height appear, neither of which has any special claim to the distinction of belonging to the primitive stem, as we often see in the Lime and Apple-trees.

are scaly buds formed? Where not formed? Structure of the Bud, describe. Embryo, proofs of its existence in the bud. Process of its development and vegetation, describe. Primary axis, in what trees distinguishable?—in what not?

176. **NODES.**—The *points at which leaves are produced* are called **NODES**, because the tissues are there condensed into a kind of *knot*, as you may see by examining any leaf-bearing twig, and also at figs. 10 and 11. The nodes are very distinctly marked when the base of the leaf surrounds, or nearly surrounds, the stem, as in the *Polygonum* tribe, one of which you may see in this volume under the delineation of *Polygonaceæ*. The nodes are sometimes called *joints*, and there is occasionally a real articulation at these points; but if they are marked no otherwise, they are rendered conspicuous by the *scars* of the falling leaves.

177. **INTERNODES** are the spaces between the nodes. The rudimental stem consists of a definite number of these leaf-bearing points and the undeveloped spaces between; and the growth consists in an elongation of the whole extent, so that the nodes are gradually drawn apart, giving room for a free expansion of their leaves.

178. The stem, as you have seen, is lengthened by the expansion of the terminal bud (fig. 10). Palms, with few exceptions, produce only terminal buds, when the stem is entirely without branches, and is said to be **SIMPLE**. But most plants show a disposition to produce branches. These spring from lateral buds, which are termed **AXILLARY**, because they arise from the axils of leaves, or the angle between the leaf, or leaf-stalk and the stem, as in fig. 11. By this means the undeveloped axes, or growing points, are multiplied, and the tree extends itself horizontally. Every branch may thus be considered a new system of vegetation; for it multiplies the starting points, and continually repeats the primitive process of development, every particular branch and branchlet being crowned at last by a terminal bud.

179. **ARRANGEMENT OF THE BRANCHES.**—As these are developed in the axils of the leaves, it is obvious that they must have the same arrangement. Branches are **OPPOSITE** when they spring from the axils of opposite leaves, as in the Lilac and Horse-Chestnut; when they spring from the axils of *leaves alternately arranged*, they are **ALTERNATE**, as in the Chestnut, Lime-tree and Buttonwood; and when they spring from the axils of leaves occupying a ring round the stem, they are **VERTICILLATE**, or *whorled*.

180. Were there no interruption of these secondary means of development, the tree would be perfectly symmetrical; but several circumstances interfere with them, and more or less impair the symmetry of growth. These

are chiefly Undeveloped Buds, Adventitious Buds, and Superfluous Buds.

181. **UNDEVELOPED BUDS.**—The whole number of buds formed by trees are never at any time developed. Indeed they cannot be all of them designed for development; but in their plentiful production, the means of continuing the plant are multiplied, and provision is made for cases of accident. If the terminal bud is destroyed, some of the lateral buds, which else would have remained inert, are put forth, and thus supply its place. In this way, when the foliage of trees has been destroyed by canker-worms, or frost, they are often reclothed so rapidly, that their returning verdure seems to have been recalled by the power of magic; but the necromancy rests entirely in the sudden development of *latent buds*.

182. Buds which have remained latent, embedded for years in the trunk of trees, when approached by an accidental opening, have forced their passage through the wood, and put forth into new branches. The non-development sometimes proceeds in a regular order. When the branches are opposite, the growing points are generally crowned by three buds, but all of these seldom grow. The terminal bud usually continues the growth, and the two lateral ones remain latent, as in the Maple. But sometimes the lateral buds are developed, and the terminal one is suppressed, when the stem becomes regularly forked, as in the Lilac, and the beautiful little plant known as *Innocence*, fig. 9.

183. **ADVENTITIOUS BUDS.**—Stems that are gorged with sap often produce buds out of the regular order, as in the Willow tribe. These are called **ADVENTITIOUS BUDS**, and in trees they are usually deposited in the wood, at the ends of the Medullary Rays (198), and spring from the new and tender tissue which has lately been deposited. The beautiful shades in the Bird's-eye Maple are said to be owing to the numerous adventitious buds which have become incorporated with its wood.

184. **SUPERFLUOUS BUDS** appear to be often produced by an irregular multiplication of the axillary buds. Thus in extremely vigorous trees, three buds may be produced instead of two, or two instead of one. But all these irregular multiplications of the bud have one common origin—in the excess of nutriment and of vitality in the vegetable tissues.

185. Thus the symmetry of a tree may be disturbed by two very important influences—first, the non-de-

Points of leaf insertion. Name. Why so called? What sometimes called? When conspicuous? Spaces between nodes. Stem lengthened, how? What trees produce only terminal buds? When only these are produced, what arrangement has the stem? How is it generally? How

are branches produced? Each branch may be considered what? What arrangement have branches? Why? What causes disturb the symmetry? How are undeveloped buds often useful? What of latent buds? Shades in Maple-wood, by what caused?



General subject. What does fig. 1 represent?—fig. 2? What difference between them? Describe fig. 3. What does fig. 4 represent? What at 1 and 2? What three figures in the plate are Endogens? To what family does each belong? Describe fig. 6—its mode of twining. Fig. 8, what difference between it and fig. 6? What kind of stem has the Grape?—the Strawberry? Point out the Twiners—Cleavers—Climber—Creeping stem—Trunk—Offset,

velopment of regular buds; and secondly, the production of irregular buds. But although the mathematical order is sometimes thus infringed, the grace and harmony of nature are not impaired. On the contrary, one must feel, in looking at a fine tree—however irregular may be its proportions—that it must be a daring hand that could attempt an alteration; and the thoughtful mind will recognize in these seeming accidents, only a profounder wisdom, and a more excellent beauty.

186. THORNS are abortive branches, which in their dry and undeveloped state become rigid. That this is really the true explanation is shown by their sometimes putting forth leaves, as in the Sloe, fig. 5. Naked thorns, and one clothed with a few leaves, are also seen in fig. 6, which represents a thorny shrub of Palestine. Thorns, prickles and stings, seem to be a kind of natural weapons in plants, and are analogous to the horns, tusks and stings of animals. These, in some cases, disappear under the influence of culture. Hence Linnæus poetically considers such plants *tamed*, or deprived of their natural ferocity; and in sober truth, if thorns are really undeveloped branches, there is a very good reason why the higher degree of nutriment found in cultivation should cause them to disappear in the completely developed structure.

187. DISTINCTION BETWEEN A THORN AND PRICKLE. —A Thorn is an extension of the wood; a Prickle is a continuation of the bark only (84), as you may assure yourself by peeling off a small section from the stem of a Rose or Bramble, when the prickle will be removed along with the bark; but a Thorn treated in the same way shows its connection with the wood.

188. A TENDRIL is a slender, leafless branch, with a spiral extremity, by which it clasps a firmer body that may serve as a prop. In the Grape, fig. 4, the tendrils take the place of suppressed leaves, from whose axils they arise. They are also branched, as in the Sweet Pea, fig. 8, and thus the means of support are multiplied. The tendrils of the Virginian Creeper will adhere to smooth marble, like the rootlets of Ivy. Sometimes the tendrils belong to the leaves, as in the Pea and the Lentil, fig. 7.

189. The leaf-buds of many trees are very beautiful in their partial expansion. Among these, that of the Horse Chestnut, which contains both leaves and flowers, is very conspicuous. But the most splendid example known among us is found in the Walnut, the buds of which re-

semble half-blown Tulips, whose petals have a texture of the richest velvet, varying in color from a delicate flesh-white to a tinge of the finest gold, sometimes relieved and softened by a hue of blush-red, or a tinge of ashen gray.

CHAPTER XV.

THE STEM, OR ASCENDING AXIS.

190. STEM DEFINED.—*That part of the plant which develops upward, seeking the air and light, is called the STEM; and in respect to position, it usually has a diametrical opposition to the Root.*

191. DISTINCTIONS OF THE STEM AND ROOT.—And between these two organs there are some other quite remarkable differences, which we will briefly notice. The Stem grows by an extension of its whole substance; the Root by an application of new material to its extremities. The stem produces buds, and sends forth leaves, and through these chiefly it acts on the element in which it lives. The root gives birth to no organ, but its own parts. With a few remote exceptions, it never produces buds, and therefore bears only naked branches, while it acts directly on the soil, without the intervention of any other organ. The branches of the STEM are symmetrical; those of the ROOT without order.

192. All phænogamous plants possess stems, though in some instances that organ is very short, at others hidden beneath the soil. The first impulse of growth in the stem is to *ascend*; but it does not always preserve this direction, as you will see in the description of subterranean stems.

193. ELEMENTARY COMPOSITION.—All very young stems are composed exclusively of parenchyma, or they have only the rudiments of fibre. But in the course of growth various transformations occur, which were treated of in Chapter IV. The most remarkable of these modifications is THE PRODUCTION OF WOOD. It will be remembered that all the tribes of plants below the Club-Mosses (101), are wholly destitute of wood, and, in all the lowest forms, of every thing like fibre also; but the humblest plant that is articulated into root, stem, leaf and flower, must have some kind of fibre, or fibre-like tissue, otherwise it could not form the necessary articulations and framework of those organs.

Thorns, define. How is this proved? Idea of Linnæus. Probable Reason. Distinction between Thorn and Prickle. How proved? Tendril, define. Varieties. What buds most beautiful?

General subject. Define Stem. Distinctions of Stem and Root? Are any of the higher plants destitute of stems? Of what are very young stems composed? Most important product of transformation,

194. **COMPONENT PARTS OF WOOD.**—By examining fig. 7, Plate VIII., it will be seen that wood is not usually composed of woody fibre alone, but that ducts of various kinds enter largely into its composition. In this drawing of the Italian Reed, the different forms of the cell are represented very clearly. The single woody bundle here exhibited, though from the stem of an *Endogen* (224), shows their distinguishing points—beginning at the left hand, cellular tissue; annular and spiral ducts; then a series of bundles composed of woody fibre, dotted and spiral ducts, and wood; and, finally, parenchyma again in the cells of the rind, the two outermost layers of which have some dots of chlorophylle.

ANATOMY OF THE STEM.

195. It will be seen by the above analysis that a woody stem usually consists of three principal portions—the **PITH**, **WOOD**, and **BARK**. The organic structure of these must be considered separately.

196. **THE PITH.**—This, as you have doubtless often seen, occupies the centre of the stem; and by aid of the microscope we discover that it is composed of parenchyma, the structure of which has already been examined, and may be seen in fig. 8, at *a a*. The cut represents a woody stem of three years' growth. The figures 1, 2, 3, mark the growth of each year which is deposited in layers, and the letters refer to the same points in both parts of the figure. In the young state, the pith is filled with nutrimental juices; but often, from a rapid growth, or other causes, it is absorbed, and the centre of the stem becomes hollow, as in the Grasses; or the pith is pressed inward by the vigor of growth in the outside, and is finally obliterated, as in our forest trees. It appears to be directly serviceable to the plant only in the early stages of life; for as it advances in strength, it always gradually diminishes in volume, and at length becomes a dry spongy substance, filled only with air. To the pith belongs

197. **THE MEDULLARY SHEATH.**—This consists of a circle of spiral, or other ducts, immediately surrounding the pith, and connecting it with the wood, as in fig. 8 at *d*. But the circle of ducts is not complete, for intercepting wedges of the woody tissue protrude themselves here and there, sometimes crowding the ducts out of place. Yet still the medullary sheath maintains itself in a general way, sending off its spiral tissue to the

branches, and from these to the stalk and veins of the leaves.

198. **THE MEDULLARY RAYS** consist of flattened quadrangular cells built up in a single series, like bricks in a wall. They belong especially to the *wood*, which they traverse at regular intervals, radiating from the Medullary Sheath to the Bark. The two lines of oblong cells passing through fig. 5 are the Medullary Rays; but in this highly magnified representation, their convergence is not to be seen. This is better shown at *i i*, in the transverse section of figure 8, marked *A*, where the Medullary Rays are represented passing from the Bark to the Pith. But in the vertical section at *B* they are interrupted, the six layers or lines that are represented, not passing from the bark to the pith. The reason of this is that their layers are not arranged in a perfectly vertical direction, and owing to this slight flexure, their lines are divided or cut by a vertical section of the stem. The Medullary Rays are the remains of the Horizontal System (37). They have been compared to the *woof* of the vegetable fabric, as they are delicately shot through the woody fibres of the vertical system, which compose the *warp*. They serve to keep up a communication between all the growing parts, or the Wood, Pith, and Bark generally. They are called by joiners the "*silver grain*;" and although the cells themselves are invisible to the naked eye, yet the lines which they form are conspicuous in the cross section of many kinds of wood, and especially the Oak and Maple, to which they give a beautiful silvery lustre. The Medullary Rays do not always reach entirely from the pith to the bark.

199. You have already obtained some idea of the general structure of the Wood, as well as its component parts. These are very well portrayed in the Italian Reed, at fig 7, and also in fig 8, where the wooden tubes and ducts—maintain their relative positions in the stem. In a section of the wood of the Plane-tree, fig. 10, the structure is seen as it occurs in a more condensed form, but still more highly magnified. The mode in which the tubes, both of the proper wood and ducts, overlap each other by their pointed ends, is well shown, clearly representing the complete isolation of each cell, or tube, and hence the identity of the general structure with that of parenchyma, or the primitive cellular tissue. The divided ends also show the respective calibre of the ducts and wood-cells—that of the former being repre-

Of what not wholly composed? Composition of Pith. The Medullary Sheath. Three principal parts of a woody stem. Describe Pith. At what stage most abundant? Probable use. In what plants obliterated? Its changes, describe. Describe Medullary Sheath. What tissue chiefly prevails in it? In what parts deposited? Medullary Rays How arranged?

To what parts belong? How deposited? What parts connect? In what section of the figure are the lines complete? Why not in the vertical? Of what are they the remains? To what compared? What called by Joiners? In what woods conspicuous? Of what is wood formed? Which have greatest calibre? How are the tubes arranged, and what does it prove?



General subject. Describe fig. 1. Of what is it a variety? What difference? What at 3?—at 4? How are such plants useful? How annoying? Describe fig. 2. What are the marks or dots on the tubers?—On the blackened tuber. Describe fig. 3. What at *a*?—at *b*? Describe fig. 4. How does it

grow? What marks? What name? Figs. 6 and 9, what analogy? Fig. 7, explain structure. What figure represents the Creeper, the Tuber, the Scaly Bulb, the Tunicated Bulb, the Rhizoma, the Corm, the Bulblet?

sented by open mouths *a*, and that of the latter by minute specks, *b*, showing that they have nearly passed into the solid state, the bore being almost obliterated. In fig. 5 is a transverse section of wood from the same tree, showing more clearly the wide bore of the ducts, and the dot-like calibre of the wood-cells, which are almost entirely filled up by an accumulation of the *Secondary deposit* (38), that has greatly thickened their walls.

200. LIGNINE.—The wood-cells and ducts collectively, or the substance of wood, is termed LIGNINE. This substance is richer in carbon and hydrogen, and hence in the materials of combustion, than any other tissue in the vegetable frame. But it does not consist entirely of organic material, for in the thickening of its cells a large quantity of earthy matter is deposited in their walls, as you have before learned. This consists chiefly of salts of Potash, and is shown by the deposit left after burning, for the chemical basis of common wood ashes is potash; and if there were no earthy element there would be no ashes. The harder kinds of wood, as Oak, Maple and Hickory, abound in the ligneous deposit, while they have less of water than the softer kinds; and this gives them their great value, not only as fuel, but in the various mechanic arts.

201. HEART-WOOD AND SAP-WOOD.—The old wood that occupies the centre of the stem is called the HEART-WOOD; while that which lies next the bark, from its beautiful white color, is named the ALBURNUM, or Sap-wood. In the latter alone the vital forces of the wood exist; for the Heart-wood is so far a dead substance, that it appears useful to the tree chiefly, if not entirely, in affording mechanical support, and preserving the unity of the system, by keeping the form entire. We may see the truth of this assumption in those trees that live, and bear fruit, many years after their trunk has become a hollow cylinder. Whenever the distinction between the Heart-wood and Sap-wood is strongly marked, the latter assumes a particular and definite color. The yellow hue of the Fustic, the black of the Ebony, the beautiful dark red of the Mahogany, and the rich colors of the Black Oak and Black Hickory, all exist in the Heart-wood.

202. THE CAMBIUM LAYER is a stratum of extremely delicate and vital cells, which are interposed between the wood and bark, and belong equally to both. They are of an oblong form, and may be seen in the lines *e e*,

fig. 8. They are formed of a mucilaginous liquid called the CAMBIUM, which has already been noticed (54). From these cells is developed a layer of Wood on the one hand, and a layer of Bark on the other; while another supply is sent off to replenish and reinvigorate the Medullary Rays.

203. THE BARK is at first composed entirely of parenchyma, and the external layer is green, from the chlorophylle (65) which it contains. But when the stem begins to form woody tissue, a portion of woody fibre is distributed in the Bark, the inner layers of which become fibrous, while the outer layer gradually loses its green color, and assumes an ashen gray. The Bark is composed of three distinct layers—the Liber, the Cellular Envelope, and the Corky Envelope.

204. THE LIBER.—This is the white inner layer of the bark, and is so called, not only because it exfoliates in thin plates resembling the leaves of a book, but because the liber of many trees has been used instead of paper for writing. The fibres of this integument are long and very tenacious, as you have seen in the description of the Bass-tissue (42); and for this reason they are used for many purposes in the manufacture of cordage, and various woven fabrics, a more particular account of which will be found in that section of the Economical Uses of Plants that treats of the Bark. The position of the Liber is seen at *f*, in fig. 8, being next outside of the Cambium Layer.

205. THE CELLULAR ENVELOPE, or Middle Layer, of the Bark comes next in the outward direction. This, in the young state, may be known by its green color, and from this circumstance is sometimes called the Green Layer. It is shown at *g*, in fig. 8, and does not usually increase after the first year or two. By the thickening of the Corky deposit next outside, it is excluded from the light, without which chlorophylle cannot be formed; and it gradually perishes, never to be renewed.

206. THE CORKY ENVELOPE.—This, in woody stems, surrounds the Cellular Envelope, and consists entirely of flattened tabular cells, as may be seen at *h*, fig. 8. The peculiar colors that distinguish the new bark and young twigs of different species, are due to this envelope. Every one who has had the taste for a walk in the woods early in spring, must have observed the pleasing variety of tints which they assume, changing from sober ash to a lively brown, crimson, or bright yellow, thus giving to the monotonous landscape the vivid effect of flowers.

bium Layer, define. Of what formed? What does it develop? Bark, of what first composed? How many layers? What called? Inner bark, describe. Why so called? Its fibre. Its particular tissue. Position of Liber. What layer next? How known in its young state? Is it permanent?

Of what besides organic material does wood consist? How shown? Of what salt chiefly consist? Why are hard woods better than others? The substance of wood—name—in what is it rich?—two principal parts of wood. In what part are vital actions maintained? Why called Alburnum? Position of Heart-wood. What proves it a dead substance? Colors. Cam-

207. It is the corky envelope which exfoliates in large continuous sheets from the Birch tree. This is of a peculiar structure, the firm layers of tabular cells alternating with others less compact and durable, which, when existing in contact with a vital layer below, crumble to dust, and thus cause the bark to peel off.

208. CORK.—Sometimes an unusual development of this tissue occurs, as in the Cork-Oak. The bark of this tree, which is a native of Southern Europe, exfoliates once in eight or nine years, affording that very useful article known in commerce as CORK. Some species of Elm, and the Sweet Gum tree, also yield cork.

209. At fig. 4 is a section from the stem of the Maple, at the commencement of the second year's growth. *A* is the transverse section; *B* is the vertical section. The spiral vessels around the pith are seen at *t*; the ducts are marked *v p*, and the bundles of woody fibre, *f*; *c* the cells of the cambium layer; *pc pc*, the cellular layers of the new wood and bark; *f* the fibrous cells, or liber, between; *s* the corky layer; and, outside of all, is the common integument, with projecting hairs. At fig. 9 is a transverse section of the Oak, showing, in the six white concentric circles of wood, the growth of six years, while the same number of rings are seen in the bark. The circles of dark dots inside of the woody tissue show the position of the ducts.

210. COMPARATIVE CONTINUITY OF THE BARK AND WOOD.—The same circumstance which solidifies and makes the wood durable, contributes to the destruction of the Bark—namely, the GROWTH. As this chiefly occurs in the Cambium Layer, between the wood and bark, it must be external to the first, and internal to the last. Hence, while the old wood on the one hand is rendered compact and hard by the inward pressure, the bark, on the other, is greatly distended and torn by the outward pressure. Thus while the one is continually confirmed in its solidity, the other is continually undergoing changes, both from this cause and the corroding influence of the elements without. Hence the bark on old trees is never entire. It is marked by cracks through its whole extent, and often by deep fissures. The dead parts fall off in layers; and as the cells of the bark soon cease to grow, the proportion of bark to wood is much less in old than in younger trees.

211. The three layers of bark which have been described are not to be distinguished in old trees, or rather in old parts of the tree, for there the middle or green

layer is generally obliterated; but in young woody stems and branches they are very distinct and clear.

CHAPTER XVI.

THE STEM—ITS MODE OF GROWTH.

212. By the first and most obvious principle of division, stems are ranked according to their size, as constituting Trees, Shrubs and Herbs. Between the two first there is no absolute line of division, as a small tree may be a large shrub, and the reverse. There are, however, some general distinctions worth observing.

213. A TREE is a plant with a woody stem, that rises a considerable height from the ground before it puts forth any branches; and some authors suppose that it should be about five times the height of a man to be assured of its title. But sometimes large trees branch close to the ground; and there are many which it would scarcely do to call shrubs, that are less than twenty feet high.

214. A SHRUB is a plant with a woody stem, that branches near the ground, and is less than twenty-five feet high, as the Currant.

215. UNDER-SHRUBS are more diminutive forms of the shrub, as the Whortleberry and Sweet Fern.

216. AN HERB is generally a plant of smaller growth, composed chiefly of cellular tissue, and having comparatively a small portion of wood in its system, as the Daisy and Sunflower.

217. The Herb, Tree and Shrub, are well contrasted in figs. 1, 2 and 3, Plate VIII. But there is a fundamental difference in stems, by which they are ranked according to their

218. MODE OF GROWTH.—All Phænogamous plants are thus divided into two great ranks—Exogens, or Outside Growers, and Endogens, or Inside Growers. The first correspond with Dicotyledones, and the second with Monocotyledones; for all plants with two cotyledons have exogenous stems, and all with one cotyledon have monocotyledonous stems. Exogens may be represented by the Almond tree, fig. 2, and by most of our common herbs, shrubs and forest trees; and Endogens by fig. 6, and by the Lily, Grass, and Palm tribes generally. We will now proceed to notice the differences of structure that distinguish these strongly defined classes. All their varieties radically depend on the MODE OF

What layer next? Describe. Colors. Spring-walk. What substance produced? From what tree? What other trees? Longest life has Bark or Wood? Reason of the difference. Trace the component parts of the Stem. What layer obliterated in old bark?

General subject. Most obvious division of stems. Define Tree—Shrub—Under-Shrub. Herb. What division? Correspondence. Synonymes. Explain.



General subject. What do figs. 1, 3 and 4 represent? How are the leaves at 1, at 3, at 4, at 8? What figures are of Net-veined leaves—Parallel-veined—Forked-veined? How are the veins in the Water-Chestnut—in the Orchis—the Grass—the Palm—the Castor-oil plant—the Fern—the Acacia? What large groups are distinguished by the two principal forms? Figures of radiately veined leaves, what?

GROWTH, or the manner in which the Fibrous system is deposited in the Cellular.

219. **EXOGENOUS STRUCTURE.**—Fig. 9 represents a transverse section from a stem of the Oak. It is composed of distinct concentric zones, or circular layers, one of these being formed every year from the vital nutriment in the Cambium Layer (202), and deposited between the Liber and Alburnum, or the outer wood and inner bark. A new layer of wood is thus formed on the outside of the older tissues, which are pressed inward, and become greatly solidified, so that the tubes almost lose their calibre, as you have already seen. This mode of growth is favorable to increase in diameter, and a wide lateral development; and consequently we see, very generally, stout and thick stems in our forest trees, with an umbrageous expansion of the branches. It is also favorable to longevity; for as all the vital forces are renewed annually, and the woody accumulation in the tissues serves for mechanical support, it would seem that there could be no necessary limits to the life of such a tree. The general structure of an Exogenous stem has been very clearly defined in the last chapter, in the Anatomy of the Wood.

220. **ENDOGENOUS STRUCTURE.**—Here there are no distinct layers, but the woody tubes are deposited among the cellular tissue, without any apparent order. The new wood in growth is deposited toward the centre, and becomes indistinguishably mingled with the old, which is pushed outward. Thus the growth can only take place by a gradual distension of the stem; and that no longer than while it remains sufficiently flexible to yield to the pressure. The vital action being thus checked horizontally, takes an upward direction; and hence Palms, and other endogenous trees, are distinguished by those lofty and slender forms which are at once so majestic and so graceful. In fig. 6 may be seen a section of a Palm stem, with the bundles of woody fibre curved first toward the centre, and then toward the circumference, and thus interlacing each other. In the transverse section at the summit, may be seen the divided ends of the fibre, appearing like dots. But in the arborescent Yuccas the stem remains soft, and thus capable of unlimited distension—a feature which is more remarkably shown in the gigantic Dragon-tree of the African Islands,

which appears like an enormous herb, and is, in fact, a kind of Lily. In Palms the wood of the lower parts of the stem is more solid and compact than that of the upper.

221. The stem of an Endogen affords no definite distinction of pith, wood, and bark, nor is it traversed by medullary rays. It consists of threads, or bundles of woody fibre, surrounding a group of ducts. These bundles may be traced directly from the base of the leaves, and in some instances clear to the roots, in young plants. At other times, curving outwardly, as seen in the figure, they lose themselves in the cortical integument of the rind, which is thus interwrought with the woody system, and becomes inseparable from it—or is not to be separated as a distinct layer.

222. As Palms generally do not form lateral buds, if the terminal bud is destroyed, they, having no means of reproducing it, decay and perish. The leaves are borne in a cluster at the summit; and the diameter of the trunk, never being contracted by the protrusion of branches, which, in dividing the substance must diminish the bulk, is of nearly equal thickness through its whole extent.

223. But sometimes two or more lateral buds develop, and the stem branches. This is seen in the Screw Pine, fig. 3, Plate IX. In this and all such cases, the branches preserve the Palm-like character, and are cylindrical, producing leaves only at their extremities. But in those endogenous plants where lateral buds are freely produced, and leaves and branches are scattered along the stem, it tapers upward as in the exogenous forms. The Asparagus is the most familiar instance of this arrangement, while the Indian Corn furnishes a fine example of the ordinary structure of Endogenous stems.

224. **EXOGENS AND ENDOGENS.**—Exogens have *two* seed-leaves; they grow by depositing new cells in *Concentric Circles*, on the outside of the wood, or between it and the bark; *they form lateral buds*; and their stems are distinguishable into Pith, Bark, and Wood. Endogens have but *one* seed-leaf; they do *not* deposit their wood in *Layers*, nor on the *outside*, but in the *centre*; they have no definite distinction of Pith and Bark; and they *SELDOM FORM Lateral Buds*.

STEM FORMS. AERIAL MODIFICATIONS.

225. In respect to their external form, stems may be

Define Shrub, Under-shrub, Herb. On what principle is the next great division? What two great classes? How marked? With what other division does each correspond? Instances of each. Describe the Exogenous structure. Endogenous. Where is the new wood deposited in Exogens?—In Endogens? In what direction do Exogens incline to expand?—Endogens? What distinctions nearly or quite lost in the endogenous stem? To what may its bundles of fibre be traced? What parts inseparable or indistinguishable in Endo-

gens? Why do not Palms grow thick and stout, like Oaks—or Oaks tall, like Palms? What hinders lateral growth in the latter? In what case do they continue to expand horizontally? What remarkable instance of lateral expansion? Distinctions between Exogens and Endogens. Why are Palms not usually branched? In what cases are they? What other instances of branched Endogens? What happens if the terminal bud is destroyed? What effect has branching on the shape of the stem? What fine subject for study of the Endogen?

further divided into the *Caulis*, the *Trunk*, the *Vine*, the *Sucker*, the *Runner*, the *Offset* and *Stolon*.

226. THE *CAULIS* is the stem of Herbs, and bears both leaves and flowers. It is chiefly composed of parenchyma, and in all temperate climes is annual in duration, as in the *Hen-bit*, fig. 1.

227. THE *TRUNK* is the stem of Trees, and needs no further description, as in the *Wax-Palm*, fig. 9.

228. THE *CULM* is a jointed stem, and distinguishes the family of Grasses, as in fig. 5.

229. The *SCAPE* is a stem that springs directly from the root, and bears a flower or flowers, but no leaves, as in the *Dandelion*, fig. 2.

230. THE *SUCKER* is a branch which, proceeding from a part of the stem just below the surface, rises, and in turn becomes a parent stem, as in the *Rose* and *Mint* tribes. The *Maize*, fig. 4, furnishes a good example, the suckers being seen at 1 and 2, and the jointed culm at 3.

231. THE *RUNNER* is a prostrate stem that creeps along the surface of the ground, putting forth leaves and roots in little clusters at its extremities, and thus forming new plants, which in due time also extend themselves, and send forth runners. The *Strawberry*, fig. 10, is a stem of this kind.

232. THE *OFFSET* is a short branch, terminated by a rosette of leaves, sent off by the parent plant, and which will, in its turn, strike root and give birth to others. The *House-leek*, fig. 7, is a familiar example.

233. A *STOLON* is a branch curving until it reaches the ground, when it strikes root, and establishes itself, producing new individuals. This habit probably suggested the idea of layering. The *Currant* and *Gooseberry* are good examples. The *Pandanus odoratus* (one of the *Screw Pines*) has this habit; and at fig. 3 it may be seen, with its stoloniferous branches curved, and curving to the ground, some of which have already sent up new branches, crowned, like those of the parent tree, with tufts of leaves.

234. THE *VINE* is a plant whose stem, being too weak to preserve an erect position, clings to a firmer body for support. When the plants ascend by means of tendrils, they are called *Climbers*, as in the *Grape*. In the *Clematis*, the leaf-stalk performs the office of a tendril; while in the *Pea* and *Vetch* tribes, the tendril is a prolongation of the summit of the leaf-stalk.

235. *TWINERS* are plants that ascend by winding round some body which serves as a prop; and there is in every species a determined mode of twining, from which

it cannot be diverted, so long as its vital energy is not seriously impaired. In fig. 6, which represents the *Great Bindweed*, the convolutions are from left to right; and in fig. 8, the *Hop*, they are from right to left. From its proper and natural mode of ascent a twining stem cannot be diverted. If trained in an opposite direction, it will repeatedly make sharp angles and curves, in order to restore itself, until it becomes exhausted by its efforts to preserve this great law of Nature.

236. *CLEAVERS*.—Another class of plants ascend neither by means of tendrils nor by convolutions, but by the roughness of their surface, which tenaciously adheres to the supporting body; and the habit is distinguished in the common name of a large genus of plants (*Galium*), which are popularly known as *Cleavers*. One of this curious family is seen at fig. 11.

237. *RECLINING STEMS*, are those which are too weak to sustain themselves in an erect position; and they receive different names, according to their degrees of prostration. They are

(1) *ASCENDING*, when the stem rises obliquely from the base;

(2) *DECUMBENT*, when the stem trails along the ground, rising at the extremity, as in the common *Five-finger*;

(3) *PROCUMBENT*, when it runs lightly along the ground; and

(4) *PROSTRATE* or *RUNNING*, when it keeps close to the surface, sometimes burrowing beneath the ground. Of the eleven forms of the stem represented in Plate IX., four are *Endogens*, and the remainder *Exogens*.

CHAPTER XVII.

THE STEM—SUBTERRANEAN FORMS—FUNCTIONS.

238. ONE of the results of a closer study, and more accurate observation, has been the discovery that, as a general law, the *Root* sends forth only naked branches, and therefore produces no buds. *Bulbs*, *tubers*, and several other subterranean modifications of the growing axis, are for this reason separated from *Root-forms*, and they are now ranked among stems. By this arrangement, both the *Scaly* and *Creeping Roots* of the old Botanists are now considered as *Stems*.

239. The principal subterranean modifications of the *Stem* are, the *Tuber*, *Corm*, *Rhizoma*, *Bulb*, and *Creeper*.

240. *TUBER*.—This is formed by the terminal bud of

Principal stem-forms, define and describe each. When plants ascend by means of tendrils, what are they? When they wind round a prop? What effects when a twining stem is turned from its course? Give examples.

General subject. Why are these separated from *Root-forms*? What termed by old Botanists? Why incorrectly? Principal Subterranean Modifications. Define and describe each.



General subject. Name each of them. Instances of each. Define Cordate | between figs. 2 and 3—4 and 9—13 and 14? How is fig. 8—17—19? How is the
 —Ovate—Spatulate—Acrose—Sagittate—Rhomboidal—Connate. Difference | Venation in these leaves? What, then, do they indicate, Endogens or Exogens?

a subterranean branch, which, becoming greatly thickened, develops into a fleshy knob, having numerous buds. The Potato, in which the buds have the popular name of *eyes*, is a familiar instance. The Jerusalem Artichoke, fig. 2, Plate X., is also a fine example. The tubers, in different stages of progress, are seen crowning the several branches; while one of them, exhausted by the efforts of the preceding year, has no buds. The Tuber is well stored with starch, to be expended in the future growth of the plant.

241. THE BULB may be defined as a subterranean Bud, usually clothed with scales, which, like those of the Bud, appear to be undeveloped leaves, as in the Lily, fig. 5. If the bulb consists of concentric layers, it is said to be tunicated, or coated, as in the Onion. A transverse section of this kind of bulb, showing the layers, is seen at fig. 7. The vertical section of a Bud, fig. 6, and that of the Lily-Bulb, fig. 9, illustrate the analogy of structure between the Bud and Bulb. The latter is, to all intents and purposes, a subterranean BUD.

242. BULBLETS are small aerial bulbs, which are developed in the axils of the leaves, as in the Tiger-Lily, fig. 8.

243. THE CORM is a solid bulb of a round form, and a compact, uniform texture, as in the Wake-Robin, and the Meadow Saffron, an English plant, fig. 3. At *a* is the old corm, nearly exhausted, while the fresh new corm is seen at *b*.

244. THE RHIZOMA is a thickened horizontal stem. It has the same mode of growth as the aerial forms, increasing at the apex from a terminal bud. The scars of former stems are to be seen on its surface, and to these marks the Solomon's Seal, fig. 4, is indebted for its name. The Sweet Flag, Ginger, and our native Iris, are also examples.

245. THE CREEPER is a variety of Rhizoma, from which it differs chiefly in size. The *Carex arenaria*, fig. 1, is a creeping stem, which often renders important service in binding the loose sands of low maritime shores. The terminal bud, in this plant, remains subterranean during the first year. In the second year it ascends, puts forth a creeping branch, with a cluster of leaves and roots; and year after year this operation is repeated, the plant thus extending itself indefinitely. At 3 is the stem of the present year, at 4 a section of the last year's stem. The Knot-Grass, a troublesome weed in door-yards and gardens, has a very branching stem of this kind. It is so extremely tenacious of life, that if but a single joint

is left it will grow and spread rapidly, so that, if it once gets rooted, it is very difficult to exterminate.

FUNCTIONS OF THE STEM.

246. The most obvious design in the structure of the Stem consists in the mechanical support which it affords to the superincumbent growth, but it has also equally important vital functions. The Stem keeps up a more or less active communication between the remotest vegetable organs, the Root and Leaf; and thus it is manifestly a great *conducting medium*. The Root absorbs the surrounding liquids and gases by *endosmose*. These constitute the CRUDE SAP, which, with every step, as it rises, meeting with denser, because more highly elaborated liquids, it continues to ascend by the same law, under the influence of the superior vital law, finding passage in the early stages of growth mostly through the *dotted ducts*, but afterwards through the *newer wood*. When arrived at the branches, the currents are subdivided and sent into the branchlets; thence, by innumerable ramifications, they pass into the leaf-stalks and veins, whence they again repeatedly diverge; and thus entering the smaller veins and veinlets, they visit and refresh the remotest particles of the leaf. There, having been acted upon by the light, in a manner hereafter to be more particularly described, the innutritious portions rejected, and the nutritious elements more highly elaborated, they form a whitish, and somewhat viscid substance, which is known as CAMBIUM, or ELABORATED SAP.

247. The liquid thus prepared holds in solution the Elements of the Vegetable Tissues; and having completed its tour in the leaves, it immediately sets off on its homeward journey to the Root; but only a small portion eventually arrives there. On its passage through the Stem, it deposits the Cambium Layer (202); and from this stratum is sent forth nutriment, which, taken up by the Medullary Rays (198), passes into the Alburnum (201), and all the vital parts of the wood. Thus a new layer of wood is formed on the one hand, and of bark on the other.

248. Nor is this all. A considerable proportion of the Cambium is appropriated to supply those cells in which the peculiar products of the plant are elaborated. These are found mostly in the Bark, which is generally the chief place of deposit for the medicinal and other active properties of the plant. Continuing these offices

What is deposited in the Tuber, and for what purpose? How is the Bulb in the Lily? How in the Onion? Most obvious functions of the Stem? What other functions? What office has it between the Root and Leaves? Describe the ascent of the Sap. By what law does it rise—through what parts, in the

young state—afterward—what higher law—what changes—how does it progress—how diverge—what at last reach—what change—by what influence—what separation occurs—what is it then—what hold in solution? Describe the passage back. Through what strata does it pass? What deposit?

throughout the whole stem, the remainder of the Cambium at length reaches the Root, which, it will be remembered, having no digestive organs, can elaborate no nutriment for itself. To this it not only supplies new materials of growth, but also, by enriching its juices, enables it to maintain the action of Endosmose, by which new currents are continually put in motion. Thus the circumnavigation of the Vegetable System is complete. By a continued repetition of these processes, the tree lives and grows year after year, until, in contemplating its majestic proportions, we forget that the life of the simplest herb that dwells beneath its shadow, is an illustration of the same beautiful laws.

CHAPTER XVIII.

THE LEAF.

249. ORGANIC PARTS.—A leaf consists of two distinct parts—the flattened expansion called the **BLADE**, and the frame-work that supports it, which is the stalk and veins. The first is composed of cellular tissue, the latter chiefly of woody fibre. The leaf-stalk is called a **PETIOLE**. When the petiole is not present, the leaf is said to be *sessile*.

ANATOMY OF THE LEAF.

250 Leaves almost always expand horizontally, presenting one surface to the earth, and the other to the sky. This is their regular position; and corresponding with this, we commonly find a very marked difference, both in color and texture, between the upper and under surfaces, which is appreciable by the naked eye. By aid of the microscope we find that the apparent difference originates in the intimate structure of the parts.

251. THE UPPER SURFACE is usually composed of a single layer of oblong cells, very compactly arranged, with their ends presented to the expansion, so as to leave exposed the least possible extent of single walls and intercellular spaces. But in plants which inhabit dry and sterile regions, these superficial cells often consist of two, and sometimes of three layers. The Melon, which grows well in dry, sandy soils, has three of these compact layers, as you will see at fig. 22; and the Oleander, which is a native of Syria, has three layers also, and still more compactly arranged; while in the structure

of the Epidermis (77), there are equally important guards, which are even more under the influence of atmospheric changes. This arrangement, and some other peculiarities of structure in the leaf, are designed to check evaporation, or regulate the expenditure of fluids by the constitution and necessities of the plant.

252. LOWER SURFACE.—In this the cells are oval or ovate, and very loosely arranged, so as to admit of many intercellular spaces, as in fig. 22. But in leaves which present their surfaces equally to the light, there is no difference between them, as in the Iris and Pine tribes.

253. Light acts healthily on the upper surface of leaves, hurtfully on the under surface; and if by any accident, as high winds, they become displaced, they appear to make a voluntary effort to regain their true position. In this way, plants that stand continually with one side to a window, grow awry, being drawn around, by the impulse of the leaves, in their determination to present their upper surfaces to the light. When cultivators wish plants to be symmetrical, they turn them frequently. Some very interesting experiments on this point were made during the vegetation of the young Bean plants, which served as models to illustrate Germination in our fifth plate. A vigorous young plant, about four inches high, while standing near a light window (but not in strong sunshine), was observed to have made a curve in the stem, in order to present the upper surface of its leaves more completely to the light. It was turned round, when in the course of an hour it had straightened itself, and in another hour had made an opposite curve. By this time candles were brought in, when one of them being before the plant, in the course of the evening it turned completely back, and made another curve toward the candle, proving itself equally sensitive to artificial as to natural light.

254. THE EPIDERMIS, or outer integument, usually consists of a single layer of flattened cells. But this organ also, when evaporation is to be restrained, affords the same safeguards as the cells beneath, having in many cases two strata of cells, and in some cases three. In the Cacti—a tribe whose fleshy, succulent stems perform the office of leaves, which are entirely wanting—the epidermis is of a peculiar structure. As these plants inhabit dry sands, bare rocks, and the hottest and most sterile situations, they are admirably fitted to retain for a long time whatever moisture they may acquire, either from the atmosphere, rain, or dew. The epidermis is

What effect? What chiefly in the Bark? Where at last arrive? What service to the Root? Why does not the Root elaborate its own food?

General subject. Of what parts does the leaf consist? The elementary constituents of each. Name of the Leaf-stalk. When absent how is the leaf? In what direction do leaves usually expand? What surface to the light? How

affected by light? What instance? Structure of the upper surface. How in natives of very dry soils? Why? Under surface. Name of the outer integument. What openings? What organs are they? On what principle constructed? Describe the operation.



General subject. Name each figure. Point out the difference between figs. 1 and 2. Define Sinuate—Linear. Describe the Sinuate leaf—the Lyrate—the Pinnatifid—the Runcinate. How is the Pedate leaf—the Palmate? Describe the Peltate leaf—the Oblique leaf. How are the leaves at fig. 12? How many leaves of Exogen—what of Endogen—how do you distinguish their characters? If the lobes at the base of the blade in fig. 13 were developed equally, what kind of leaf would it be? What is the distinguishing character of the leaf in fig. 14? How do 5 and 6 resemble each other—how unlike? At fig. 10 is the true palmate leaf, hand-shaped, with 5 finger-like divisions; at fig. 8 the form is also termed palmate.

formed of three strata of greatly thickened cells so that exhalation is completely checked, and the loss of moisture effectually restrained. Nor is this all. The epidermis, you will remember, is pierced at regular intervals by openings called

255. **STOMATA.**—These are the **ORGANS OF EXHALATION**. They are situated so as to open directly into the air-chambers of the intercellular system by which they are surrounded; and through them a circulation is kept up between the cells of the interior of the leaf and the outer air. In fig. 20, two oval bodies represent the stomata. Each one, as will be seen, is composed of two lip-like processes. These are constructed on the principle of a *self-acting valve*, and are exceedingly sensitive to the influence of moisture. When there is an excess of water in the system, they elongate themselves, curving outwardly, and thus open a passage for the exhalation of the superfluous water. But when there is a deficiency of water, and they become dry, they shorten and straighten themselves, so as effectually to close the passages, and thus prevent exhalation. The very circumstance which is caused by a want of water in the system, closes the door against its useless expenditure, at the very moment when the waste would become injurious. This sensibility in the vegetable system, doubtless, to a considerable extent, supplies the place of *sensation*, which belongs to animals.

256. **POSITION OF THE STOMATA.**—These organs are generally too delicate to bear the full power of the sun, and hence they are chiefly found in the lower surface of the leaf, where they are sometimes so numerous, that 120,000 have been counted in a square inch of surface. In sword-shaped, and other vertical leaves, in which the two sides are both presented to the light, the stomata are equally distributed over their surfaces. In leaves which float on the water, as those of the White Pond Lily, the stomata are all on the upper surface; and in completely submerged leaves they are not found. There are no stomata in the epidermis of Roots.

PREFOLIATION.

257. The *peculiar manner in which the leaf lies folded in the bud* is called **PREFOLIATION**. The different ways of folding in the leaves of plants, are so uniform, as to be of some importance in the determination of their relationships. This subject at least furnishes a

very interesting study; and it may be pursued, in the happiest manner, when the leaf-bud is completely swelled, just before its expansion. Make a cross section with a sharp knife, and the mode of arrangement will be exhibited in the clearest and most beautiful manner. The buds of the Apple, Peach, Horse-Chestnut, Lilac and Walnut, may be recommended to the young student as good subjects of observation. In studying the arrangement of leaves, two things are to be observed; first, the *manner of folding in the single leaf*; and secondly, the *arrangement of the leaves in regard to each other*.

258. The following are some of the principal forms of Prefoliation in the single leaf:

(1) **CONDUPPLICATE**, when the leaf is folded toward the mid-vein, with the upper surfaces inclining toward each other, as in the Oak, Peach and Magnolia, fig. 10;

(2) **CONVOLUTE**, when the leaf is rolled up from one of its edges in a complete coil, as in the Plantain, Cherry and Apricot, fig. 13;

(3) **REVOLUTE**, when both edges are rolled outwardly toward the mid-vein, as in the Willow and Azalea, fig. 11;

(4) **INVOLUTE**, when both edges are rolled inwardly toward the mid-vein, as in the Apple, Violet and Water-Lily, fig. 12.—In the beautiful Lotus, a Water-Lily of Egypt, fig. 21, the manner of folding in the involute leaf is clearly shown;

(5) **PLAITED**, when the leaf is folded like a fan, as in the Currant, Maple and Vine, fig. 14;

(6) **CIRCINATE**, rolled up like a crosier, from the apex to the base, as in the Linden and Fern, fig. 15;

259. Secondly, of the folding of leaves in relation to each other, the following are the principal varieties:

(1) **OBVOLUTE**, when a half of each leaf embraces a corresponding half of the next, as in the Sage, fig. 16;

(2) **SUPERVOLUTE**, when one convolute leaf, embracing another, is rolled up along with it, as in fig. 17;

(3) **EQUITANT**, when the leaves successively inclose each other in parallel lines, without any inversion, as in the Iris, fig. 19;

(4) **IMBRICATED**, when the outer leaves are successively folded over the inner, as in fig. 18.

In the order of their folding in the bud, leaves exhibit their future arrangement on the branches.

260. **ARRANGEMENT OF LEAVES.**—In respect to their distribution on the stem and branches, leaves are

(1) **ALTERNATE**, when there is only one to each

What in vegetables analogous to sensation in animals? Position of the Stomata. Numbers. How in the upper surface? Under? How in sword-shaped leaves? In floating leaves? In submerged leaves? How in the Root? For what are all these guards designed? Mode of folding in the bud? How named? What buds recommended for study? What two points to be con-

sidered? Forms of Prefoliation. Define and describe each. Are the six first modes of folding in the *single* leaf, or in *associated* leaves? Define and describe the four next. How are these, single or associated forms? Instances of each mode. What modes of distribution on the branches? How with one leaf to each node?

node, as in the Apple and the Oak, fig. 1, Plate XI, and the Evening Primrose, fig. 8;

(2) **OPPOSITE**, when there are two to each node, as in the Maple, Lilac, and fig. 3; and

(3) **VERTICILLATE**, when they surround the stem in a whorl, or ring, as in Cleavers and in the Madder, fig. 4.

261. This branch of the science has of late become much expanded; and the arrangement of leaves has been found obedient to certain mathematical laws, for an account of which the inquirer is referred to "Gray's Botanical Classbook"—a most excellent elementary treatise on the Life, Structure and Habits of Plants, with which no American student should be unacquainted.

VENATION.

262. The manner in which the veins are distributed in the leaf is termed **VENATION**. This system is divided into the Mid-vein, the Veins, Veinlets and Veinulets.

263. **THE MID-VEIN** is the strong process that usually passes through the middle of the blade, from the base to the apex, as in figs. 2 and 5.

264. **VEINS** are subdivisions of the mid-vein, as in the Cherry, fig. 2, and the Water Chestnut, fig. 5.

265. **VEINULETS** are radiations from the principal veins, as in fig. 2.

266. **VEINULETS** are still more remote subdivisions, the ultimate radiations of which are often so fine as to elude the naked eye, as in figs. 12 and 14.

267. The stronger branches, or primary veins, are frequently called **RIBS**, and the leaf is said to be three, five, or seven-ribbed, as in figs. 10 and 15; while the central process is called the mid-rib. The word *Nerve* is also sometimes used to express venation.

268. There are three principal modes of venation—Reticulated Venation, Parallel Venation, and Forked Venation.

269. **RETICULATED VENATION** is a characteristic of Exogens, as in the Oak, fig. 1. Such leaves are frequently called *net-veined leaves*, which is, indeed, the shorter and better name. Net-veined leaves are of two varieties—the Radiately-veined, and the Feather-veined leaf.

270. When the apex of the petiole divides into several nearly equal processes, which radiate from the base to the circumference, the leaf is **RADIATELY VEINED**, as in the Mallow and Castor-oil plant, figs. 15 and 10.

271. **FEATHER-VEINED LEAF**.—In this the petiole is obviously continued, and runs from the base nearly or quite to the apex, giving rise to veins, which again throw off their divisions and subdivisions, forming a kind of network, as in figs. 2 and 12.

272. **PARALLEL VENATION**.—In this the veins are usually straight, as in the Grasses, fig. 11, and the Palms, fig. 13, but they are sometimes curved, as in the Orchis, fig. 6. A fine example of this mode of venation is found in the Indian Corn. At fig. 9 is seen a leaf of an Acacia, native of New Holland, which is of a peculiar structure. At the base is a kind of leaf-like petiole, which is parallel-veined; while the summit is compound and net-veined. Such a leaf is called a **PHYLLOPIUM**. Endogens are distinguished by parallel venation, as in the Lily, Grass and Palm tribes.

273. **FORKED VENATION**.—In this mode—which is a characteristic of Ferns—the veins are thrown off in two opposite pairs, or forked, as in fig. 7.

CHAPTER XIX.

LEAF-FORMS.

274. **ORIGIN OF FORM**.—De Candolle, the great French Botanist, has a theory that the forms of leaves depend on the quantity of parenchyma, and the distribution of their veins; but for our purpose, the simple facts in the case will be sufficient.

275. Familiarity with Leaf-forms is a great help in the discrimination of species, and you will now give your attention to the chief of these—merely observing, as we pass, that the names which distinguish them, being types of mere form, are also applied to all other parts of the plant.

Whenever a leaf consists of a single piece or part, it is **SIMPLE**, however much the margin may be divided, as in the Oak, Rose and Lilac. Simple leaves are

(1) **ORBICULAR**, in their nearest approach to the circular, as in the Lettuce-Liverwort and Pennywort, figs. 1 and 20, Plate XII. No leaf is perfectly round;

(2) **OVATE** (*egg-shaped*), rounded, with the stalk attached to the larger end, as in fig. 2;

(3) **OBOVATE**, rounded, with the stem attached to the smaller end; the reverse* of ovate, as in fig. 3:

* The particle *ob*, in Botany, always reverses the meaning of the words to which it is affixed.

How with two leaves in each node? In a whorl. Arrangement of the veins. What called? Parts of the venous system. Define the Mid-vein. Veins. Veinlets. Veinulets. What are the strong primary veins sometimes called? What other word used? Three principal modes of Venation. De-

scribe Reticulated venation. What sometimes called? What varieties? What great class characterize? Parallel venation. Varieties. What great class does it indicate? Forked venation. In what plants? De Candolle's Theory. Leaf Names—Forms. Define each.



General subject. Name each figure. To which of the two principal forms of the Compound Leaf do figs. 1, 4, 5, 6, 7, 8, and 12 belong? To which figs. 2, 9, 10, and 13? How are figs. 1 and 6 said to be winged?—how at fig. 4? How is fig. 5 compounded?—7?—8? How is the winged leaf at 12? What form at 3? How is fig. 9 compounded?—fig. 10? What kind of leaf at fig. 11? To which of the two principal forms does it incline? Are these leaves of Endogens or Exogens? Why?

(4) OBLONG, the breadth greatly exceeding the length, and nearly of the same breadth throughout, as in figs. 7 and 12;

(5) OVAL, when both ends are somewhat sharply rounded, as in figs. 5 and 6;

(6) DIAMOND-FORM (*rhomboidal*), as in the White Birch, fig. 10;

(7) CORDATE (*heart-shaped*), the base forming two rounded lobes, as in the Lilac and fig. 4;

(8) RENIFORM, a broader and shorter heart-form, as in the Asarum, fig. 9;

(9) LANCEOLATE, shaped like an ancient lance, with a long and curved point, as in the Peach, fig. 8;

(10) SPATULATE, in the form of an ancient weapon, called a spatula, fig. 11;

(11) SAGGITATE (*arrow-form*), the base prolonged backward, in two diverging lobes, as in the Calla and the Arrowhead, fig. 13;

(12) HASTATE, the terminal lobes smaller, but still more diverging, as in the Sorrel, fig. 14;

(13) AURICLED, the base winged with ear-like processes, as in a species of Sage, fig. 18;

(14) CLASPING, the base of the leaf embracing the stem, fig. 15;

(15) ACEROSE (*needle-shaped*), leaves clustered in long, slender and acute processes, as in the Pines, fig. 16;

(16) PERFOLIATE, when the edges of a simple leaf cohere, so that the stem appears to grow through it, as in the Honeysuckle, fig. 17;

(17) CONNATE, when the bases of two opposite leaves cohere, so as to form a double perfoliate leaf, as in the Boneset, and some species of Honeysuckle, fig. 19;

(18) SINUATE, when a winding or sinuous line describes the margin, as in the Oak, fig. 1, Plate XIII.;

(19) LYRATE, with the notches more sharply defined, and the terminal lobe larger and more rounded, as in Shepherd's-purse, and the Turnip, fig. 2;

(20) PINNATIFID, with the lobes reaching to the mid-vein, and again divided, as in fig. 3;

(21) RUNCINATE, cut into large diverging teeth, which point backward, as in the Dandelion, fig. 4;

(22) LINEAR, long and narrow, as in the Grasses, fig. 5;

(23) PEDATE, with several deep lobes, somewhat resembling a bird's foot, as in the Violet, which bears its name, and fig. 7;

(24) PALMATE (*hand-form*), with several lobes re-

sembling a hand with the fingers spread open, as in the Passion-flower, and the Castor-oil plant, figs. 8 and 10.

(25) PELTATE, having the stalk fixed near the centre, so as to give the leaf a shield-like appearance, as in the Nasturtium, fig. 9; and

(26) OBLIQUE, with the sides of the base developed unequally, fig. 13.

(27) ENSIFORM (sword shaped), long and narrow, with both surfaces alike, as in the Iris, fig. 6.

(28) Decurrent, with the margin running down the stem, as in the Thistle, fig. 14.

276. In this plate are various modes of being cut, or different forms of the lobed Leaf. The lower leaves of the Water Chestnut (*Trapa natans*) are minutely divided, while those which grow out of water are entire.

COMPOUND LEAF-FORMS.

277. When a leaf is composed of more than one piece or part, it is COMPOUND. A compound leaf may be distinguished from a deeply divided simple leaf by the articulation, or jointing together, of its several parts, which, when the leaf decays, fall asunder. Leaves have two principal modes of composition—the PINNATE FORM, as in the Locust, Rose and Pea, and the TERNATE FORM, as in Clover. Other compound forms are either variations or combinations of these.

278. The divisions of a compound leaf are called LEAFLETS, and they exhibit all the peculiarities that distinguish simple leaves. The stalk that bears them is called the COMMON PETIOLE, and the foot-stalk of each particular leaflet is called the PETIOLULA.

279. A Compound leaf is Pinnate, when the leaflets are affixed to each side of a common petiole, as in the Rose Acacia, fig. 1, Plate XIV. Pinnate leaves are also called Winged, because the leaflets serve as plumage to waft them up and down in the air.

A Pinnate Leaf is

(1) TERMINALLY WINGED, ending in a single leaflet, as in figs. 1 and 6;

(2) ABRUPTLY WINGED, ending in a pair of leaflets, fig. 4;

(3) INTERRUPTEDLY WINGED, when the ordinary leaflets are interspersed with smaller ones, as in the Potato and the Agrimony, fig. 7;

(4) CIRRHOSE, ending with a tendril, as in the Lentil, fig. 12;

Instances. What are the divisions of a simple leaf called? Water Chestnut, describe. Compound leaf, define its principal forms and divisions. What

do they exhibit? The Stalk of a compound leaf, its divisions. Describe the forms. Pinnate, its varieties. Define each.

(5) **BIPINNATE** (*twice pinnate*), when the leaflets themselves are pinnate, as in the Honey-Locust, fig. 8; and

(6) **TRIPINNATE** (*three times pinnate*), when the leaflets are bipinnate, so that the leaf is thrice compound, as in fig. 5, which represents only one leaf.

280. When a leaf consists of several finger-like divisions, it is called **Digitate**, as in the Horse-Chestnut, fig. 3.

281. A **TERNATE LEAF** consists of three leaflets, which crown the stem in a kind of whorl, as in the Clover, fig. 2. At fig. 13 is a ternate leaf of the Wood-Sorrel, whose leaflets are obcordate, or reversed heart-shape. A Ternate Leaf is

(1) **BITERNATE**, when the leaflets are themselves ternate, fig. 9; and

(2) **TRITERNATE**, when the leaflets are biternate, fig. 10.

282. A Leaf is **DECOMPOUND**, when it combines the characters of the two principal types of the Compound Leaf; and it is said to be **PINNATELY DECOMPOUND**, or **TERNATELY DECOMPOUND**, as it approaches more nearly one or the other of these forms. The leaf of Meadow Rue, fig. 11, is Ternately Decompond.

LEAF-MARGIN.

283. The **MARGIN OF THE LEAF** is generally marked by notches of various forms. The different modes of being cut present characters so uniform, as to be of considerable importance in the distinction of species. A Leaf is

(1) **ENTIRE**, when there are no notches, or teeth of any kind, as in fig. 1, Plate XV. The *Victoria Regia*, fig. 15, has a remarkable leaf. It is entire, and the margin is surrounded by a deep rim. It spreads out on the water like a great platter, often six or seven feet in diameter;

(2) **SERRATE**, with notches like the teeth of a saw, all pointing to the summit, as in figs. 2 and 3. At fig. 6 the leaf is biserrate, or doubly serrate;

(3) **DENTATE** (*toothed*), with irregular and diverging notches, as in the Plane and Chestnut, figs. 4 and 5;

(4) **REPAND**, with the margin slightly concave, fig. 7;

(5) **CRENATE**, with rounded notches, as in the Pennywort and Mallow, figs. 8 and 9;

(6) **LACINIATE** (*torn*), cut in deep and irregular gashes, as in *Aconite*, fig. 10;

(7) **INCISED** (*cut*), the margins divided by deep incisions, as in *Crowfoot*, fig. 11. Between the two last there are no absolute distinctions; the terms *cut*, *gashed*, and *torn*, being used almost, if not quite indifferently, and merely represent slight variations of the lobed leaf;

(8) **DISSECTED**, with the parenchyma greatly deficient, and barely covering the veins, so as to give the appearance of a skeleton, as in the *Water Ranunculus*, fig. 13. Submerged leaves most commonly take this form. In the *Water-Chestnut*, which has already been referred to, the dissected leaves near the base grow under water; while those that float on the surface are simple and undivided. The foliage of this plant is exquisitely delicate and beautiful;

(9) **FRILLED**, the margin greatly expanded, as in the *High Mallow*, fig. 14;

(10) **SPINESCENT**, the notches invested with thorn-like processes, as in the *Holly*, fig. 12; and

(11) **EROSE**, appearing as if gnawed or bitten by animals, as in fig. 16.

LEAF-SUMMIT.

284. The **APEX OF THE LEAF** is also marked by several variations, which are of considerable importance in specific distinctions. A leaf is

(1) **ACUTE**, when it ends in a sharp point, as in the *Peach*, fig. 1, Plate XVI.;

(2) **OBTUSE**, when it is blunt at the apex, fig. 2;

(3) **ACUMINATE**, with a greatly attenuated point, more or less curved, like a shoemaker's awl, as in figs. 7 and 8;

(4) **MUCRONATE**, ending in a bristly point, fig. 3;

(5) **RETUSE**, with a rounded notch at the end, fig. 4;

(6) **EMARGINATE**, with a small, sharp notch at the end, fig. 5; and

(7) **TRUNCATE**, appearing as if cut off square at the end, as in the *Tulip-tree*, fig. 6. At fig. 9 is a flowering branch of the same beautiful tree, showing more perfectly the peculiar form and venation of its fine leaves (285). At fig. 10 one of the *Locust* tribe is seen, with its leaflets arranged in opposite pairs, like delicately plumed wings, and retuse at the apex. In the *Lentil* of the sacred Scriptures, fig. 11, the leaf terminates in a tendril; while in fig. 13, the very acute, and also acuminate, leaf of the *Wild Radish* (*Raphanus*) is seen. The *Fronde*, a peculiar form of the leaf, is shown in the *Fern* and *Moss*, figs. 14 and 15, and the *Thallus* in the *Lichen*, fig. 12.

When twice pinnate, Three times, Leaf in finger-like divisions. Three divisions. Varieties of the Ternate leaf. Decompond leaf. Leaf-margin,

varieties. Instances of each. Leaf-summit, varieties. Tulip Tree, Locust, Lentil, Wild Radish. Frond, in what plants? Thallus, in what?



General subject. Give the character of each leaf-margin in the plate. What kind of leaf at fig. 1? Difference between 2 and 6, 2 and 4. How is the margin at figs. 8 and 9—how at fig. 14? What peculiarity at fig. 13—fig. 15? What appearance at fig. 16? How is the margin at fig. 10—fig. 11? Is there any absolute difference between these two forms? How is the margin at fig. 7? What leaf at page 12, and by what habit is it affected?

THE PETIOLE.

285. THE LEAF-STALK, or PETIOLE, is usually a half-round, the upper side being flattened, with a groove or channel running through it, as in the Crowfoot, fig. 1, Plate XVII.

The Petiole is

(1) STIPULATE, invested at the base with a pair of small leaves, called *stipules*, as in the Cherry, fig. 2;

(2) ALATE (*winged*), when invested on each side with a process like a small section of the leaf, as in the Orange, fig. 3;

(3) SHEATHING, in such plants as the Coriander and Dill, fig. 4;

(4) CLASPING or TUBULAR, when it embraces the stem, as in the Plane-tree, fig. 13;

(5) ROUND, as in the Large Mallow, fig. 6; and the Leaf is

(6) SESSILE, when it has no petiole, but is seated directly on the branch or stem, as in the Evening Primrose, fig. 5.

CHAPTER XX.

LEAF MODIFICATIONS.

286. The leaf, in many cases, takes what may be called an abnormal development, producing various irregular forms. The chief of these are, Phyllodia, Ascidia, or Pitchers, Stipules, and Bracts.

287. By an irregular expansion of the Fibrous system, and a suppression of the Cellular, the petiole dilates into a rigid blade (248), which is generally traversed by parallel veins; while the proper blade of the leaf becomes partially, and sometimes wholly, abortive. These leaf-like bodies are called PHYLLODIA. They are properly a modification of the Petiole, and present some remarkable peculiarities. You will remember that the regular position of a leaf is parallel with the plane of the horizon, or with one surface presented to the sky, and the other to the ground; but Phyllodia uniformly assume a vertical position, presenting their *edges*, instead of their surfaces, to the earth and sky. They are distinguished from leaves with a true blade by their being always parallel veined and entire; while the early leaves, and occasionally the later ones, are compound and feather veined. Phyllodia sometimes appear making an effort to return to this type, for not unfrequently they bear on their apex a true compound, net-veined blade. These Phyllodia constitute

the entire foliage of the Australian Acacias, one of which is seen at fig. 7; and these, with the Myrtaceous tribes of the same region, compose nearly two thirds of the entire forests of New Holland. In the Australian Myrtles, the blade of the leaf becomes vertical, by a twist in the petiole. A forest composed of such vegetation has a grim and rigid look, and the effect of light and shade is spectral.

288. ASCIDIA, or PITCHERS.—These are also to be ranked among unusual developments of the petiole. They are formed by the cohering edges of a dilated and infolding petiole, and appear to be constructed for the purpose of containing water. Such is the common Pitcher-plant of our wet meadows (*Sarracenia*), fig. 9. In this the tubular portion represents the petiole, while the mouth-like process at the summit is the abbreviated blade. In the Pitcher-plant of the East (*Nepenthes*), the structure is still more curious. The petiole is first expanded into a Phyllodium, then contracted into a tendril, when finally it expands in the pitcher. This is furnished with a neatly fitting lid, which is articulated with it, as if by a regular hinge, made to open and shut, as may be seen in fig. 8. It is usually found nearly filled with water, which it is supposed to secrete through the base of the petiole, whose spiral ducts are very large and numerous. This liquid, whether water or a secretion of the plant, always contains great numbers of putrifying insects. The only *living* inhabitant is a kind of shrimp, which preys on the insects, and probably lays its eggs in their bodies. The water serves the double purpose of attracting the flies and maintaining the shrimp; and, so far as the plant is concerned in this very curious and singular economy, it may be nourished by the gases evolved by the dead flies. This is not improbable, since carbon, the basis of the vegetable body, would be profusely supplied by the carbonic acid gas evolved by the decomposing bodies. The uniformity of the occurrence involves both habit and design. Some other plants, also, have the same economy, which is probably to be referred to the same cause. Foremost among these is

289. VENUS' FLYTRAP (*Dionæa*).—This plant presents one of the most remarkable instances of abnormal structure in the petiole. This organ, as in the other cases, is a dilated leaf-like body, net-veined, and bearing on its summit a somewhat reniform or obovate appendage, fringed with a border of stiff bristles. This latter process represents the blade of the leaf. In fig. 11, two

General subject. Common shape, varieties. Leaf modifications, varieties, how produced. What are they properly? Describe Phyllodia. Where found? In what plants? How presented to the light? What effect has such foliage?

Ascidia. Instances. Native plant. Exotic form. What contain? What tenant? Describe Dionæa. Describe leaf.

leaves of such a plant are represented as being folded together, while a third is open. The folding depends on a constitutional irritability, which will be discussed in its proper place. In the Water-Chestnut, fig. 10, the petiole is dilated into an air-tube, which may serve as a buoy to the floating leaves. This beautiful economy is often observed in Seaweeds, and other aquatic plants.

290. But there is nothing of the kind more curious and remarkable, than we find in the twining plant of the East Indies, called *Dischidia*. This plant ascends to the summit of the tallest trees, sometimes putting forth leaves a hundred feet from its base; while the whole stem below, being without leaves, can elaborate no food. The pitcher, which resembles a Hang-bird's nest, appears to be formed of a leaf, whose edges roll together and adhere, closing entirely at the bottom; while at the top it remains open, to admit all the moisture that falls in its way; and usually it contains a considerable quantity. But the most wonderful part of its economy is yet to be told. From the nearest portion of the stem several root-like processes are sent out, whose fibrils, entering these little cups, absorb the moisture, which the upper parts of the plant, in their insular situation, their great distance from the root, and the want of leaves below, could not otherwise attain. So wonderful and admirable are the means which often, in the absence, or irregular position of any organ, supply its place, and fulfil its offices.

STIPULES.

291. These are leafy appendages situated at the base of the leaf, or leaf-stalk. They usually occur in pairs, as in the Cherry, fig. 1, and the Lentil, fig. 3, Plate XVIII. In the Pansy, fig. 2, they are large and conspicuous, appearing to form a portion of the proper foliage. They often seem designed for the protection of the young leaves, for when the leaves develop the stipules disappear.

292. There is one fact in vegetation worth observing and remembering, which is, that tender and growing parts coming in contact are very apt to cohere, and thus form irregular, and in some respects accidental, combinations. This is particularly true of stipules; for their various modifications appear to be chiefly owing to their different modes or degrees of coherence with each other and the adjoining parts. They are

(1) *ADNATE*, when they cohere with the base of the foot-stalk, as in the Strawberry and the Rose, fig. 6;

(2) *INTRAFOLIACEOUS*, in alternate-leaved plants when both margins cohere, so as to form a sheath round the stem, as in the Rhubarb. When stipules of this form are short, dry and membranaceous, they are termed *ochrea*, as in the Buckwheat tribe, one of which is represented at fig. 7;

(3) *INTERPETIOLAR*, when they occupy the spaces on each side of opposite leaves, as in fig. 11;

(4) *SPINESCENT*, forming thorn-like processes, as in the Rose-Acacia, fig. 5; and they are called

(5) *LIGULES*, in the Grasses, where they form certain membranaceous, sheathing appendages peculiar to the Order, as in the pointed process from the base of the leaf at fig. 10.

293. The sheathing outgrowth from the base of the petiole, in the Fennel tribe, may properly be considered stipular, as in the Dill, fig. 4. The Low Cornel, fig. 8, has a pair of small stipules, about mid-way, investing its stalk. In the great Plane-tree, the cohering stipules form one foliate body, situated opposite to the leaves, which are alternate; and in the Agrimony, fig. 9, they unite in the same manner, and surround the stem.

294. When leaves are furnished with stipules, they are said to be *STIPULATE*; when they have none, *EX-STIPULATE*. The smaller stipules of the leaflets in compound leaves, are called *STIPELS*.

295. Stipules sometimes, but rarely, develop buds in their axils. They are subject to the same laws of form and venation, and perform, in their degree, the same offices as true leaves. They do not occur in every plant; in many they are wanting; but they are quite uniformly present in all plants of the same natural Order.

BRACTS.

296. These are certain modifications of the Leaf, which, as they grow near the flower, are often called Floral Leaves; and they seem to occupy an intermediate rank between the Vegetative and Reproductive Organs. They are generally distinguished from the proper leaves by a difference of form and color. They are frequently of brilliant hues, and sometimes constitute the chief beauty of the flower, as in the elegant Painted Cup of our wet meadows, where the large pea-green bracts, tipped with the most vivid scarlet, eclipse and obscure the small inconspicuous flowers, and by a common observer would be mistaken for the flower itself. The same is true of the large white bracts that inclose a cluster of small

Dischidia, describe. Of what do its rootlets supply the want? What are Stipules? How usually occur? What fact worth remembering? Of what particularly true? Varieties of the Stipule. What processes may be considered stipular? How are the Stipules in the Plane? Agrimony. When

leaves are furnished with stipules, what are they? When not? What are Bracts? What rank occupy? How distinguished from true leaves? How are they frequently? Instances. How in the Painted-cup?



General subject. Name each of the forms from fig. 1 to 8. To which of these may the character of the leaf-summit in fig. 10 be referred—fig. 13—fig. 9? What kind of appendage in fig. 11? Difference between figs. 4 and 5—i and 8—i and 8—8 and 3? What kind of leaf at fig. 14, and to what tribe of plants does it belong—fig. 12—fig. 15? When a leaf has a curved and attenuated point, what is it called—a sharp point—ending in a kind of bristle—with a rounded notch—a sharp notch—a blunt end—appearing as if cut off at the extremity? Instances of each form.

flowers, wholly void of beauty, in the Low Cornel, fig. 10, Plate XIX. In the Cornus Florida, a small tree of the same family, and usually known by the name of Box-wood, the four large white bracts are particularly beautiful, and so delicately organized, as to appear, in a superficial view at least, as the real blossom; while in the Calla, fig. 13, the large lily-white bract is the sole adornment of that superb flower.

297. In the Lime-tree, fig. 8, the bract, which bears the flowering stalk, is oval-lanceolate, and of a light yellowish pea-green; while the true leaf is ovate, or cordate, and of a beautiful dark glossy color. The bracts here also constitute the chief beauty of the tree, for they have all the effect of flowers, and last during the whole season.

298. The membranous scales of the GLUME, which inclose the spikelets in Grasses, are a peculiar form of the bract; and the scales of the flower itself are properly so termed. A spikelet is seen at fig. 4, and one more expanded at fig. 5, showing the paleæ, or bracts that inclose the single flower.

299. In the great natural Order of Compositæ, which embraces the Compound Flowers of the older Botanists, the heads are inclosed by leaflets, generally numerous and narrow, which are also called bracts, as in the Marigold, fig. 1. The scales of the ament, *a*, in the Walnut, fig. 2, and in the Willow, fig. 3, are bracts, and so are those of all amentaceous trees—a circumstance that distinguishes them into a finely marked natural Order.

300. OTHER FORMS.—The cluster of leaves at the summit of the fruit in the Pine-apple, fig. 6; those which inclose the umbels and umbellets, in the Umbelliferae, fig. 7; the thin scales of the Hop, fig. 11; as well as the bony and indurated ones of the Pine-cone, fig. 9, and the Oak-cupule, fig. 12, are all different forms of the bract. There is no absolute distinction between this organ and the proper leaf; and in their gradual transitions, they sometimes offer good illustrations of the *metamorphoses* that occur in plants, of which you will hear something at another time.

CHAPTER XXI.

FUNCTIONS OF THE LEAF.

301. THE first and most obvious use of leaves is that of furnishing *clothing* to the plant, and thus protecting

its more delicate organs from heat, cold, and other external injuries. But in addition to this, the offices of the Leaf are the most important and remarkable in nature. The principal of these are, Absorption, Digestion, and Exhalation.

302. ABSORPTION.—This is the distinctive function of the Root; yet in plants which have no root, this office is performed by the leaves, as in Epiphytes (159), or often by the whole plant, as in the Mosses and the lowest orders generally. That this power is also, to a greater or less extent, a property of all leaves, may be shown by several facts. In the first place, plants will languish in a very dry atmosphere, even when their roots are copiously supplied with water. Second, the leaves of trees and other plants, in times of drought, will revive suddenly after a shower, and that long before they could receive water by transmission from the roots. Third, when cuttings of plants are kept in vases, they will retain their freshness much longer, if their whole surface is sprinkled occasionally with a plentiful shower of water.

303. Leaves absorb chiefly by their *under* surface. This is shown by the following simple experiment. Place a number of detached leaves, of the same species, in water, with different surfaces applied to the liquid; and those which are placed with the upper surface down will wilt much sooner than those with the under surface down. Wood, in his excellent "Classbook of Botany," says that leaves of the White Mulberry, placed with their upper surface in contact with water, faded in six days; while those in the reversed position lasted as many months. Leaves absorb gases from the air.

304. DIGESTION.—This is a function precisely similar to that of the animal economy. The crude sap having reached the Leaf, traverses the green substance known as Chlorophylle, which, as has before been hinted, in connection with the solar light, produces some very remarkable chemical changes. The crude liquid, of which carbonic acid gas and water are supposed to form the principal portion, is decomposed; the carbon is retained, as the chief basis of the vegetable structure, while the liberated oxygen, and the superfluous water, are returned to the air.

305. By this process the crude sap is refined, and is converted from its inorganic state to the material of organism. This is one of the most wonderful results in

The Low Cornel. Calla. Lime-tree. What part are they in Grasses, in the Compositæ—Amentaceous trees—Umbelliferae—Oak—Pine-Apple—Hop.

General subject. Most obvious Function of the Leaf. What others? To what organ does Absorption particularly belong? How shown to exist in the Leaf? What facts? By which surface do leaves chiefly absorb? How

proved—what experiment? What do leaves absorb from the air? Vegetable Digestion, what does it resemble? What substance in the leaf does sap traverse? What effect? What substances chiefly form the crude liquid? What becomes of each? Into what is the crude sap converted? What wonderful result of Vegetable Digestion?

Nature, and by Plants only is it accomplished. By changing inorganic material into their own substance, they convert it into food for men and animals. They stand at the basis of all Life, being, in fact, the only Nourishers of the world; for men and animals only consume what they so bountifully provide.

306. In the process of Vegetable Digestion, another result, almost equally wonderful, is also accomplished; for oxygen is liberated by means which Chemistry, as yet, in vain attempts to imitate. Oxygen is the most important atmospheric principle for the support of animal life. Carbonic acid gas is the vital principle of the atmosphere for the support of vegetable life; but at the same time it is so deadly to animals, that if the air is greatly infected by it, it becomes noxious. Plants absorb this gas continually, giving in return free oxygen gas—that vital element, without which not a single animal could live or breathe, being liberated in the very act of vegetable digestion. Thus one vital office is made to counterbalance the other, and the whole is harmonized. The respiration of animals, and other causes which infect the atmosphere, give food to plants, which, by assimilating these crude and otherwise noxious substances, convert them into organism; and thus while they are purifying the air, they are also elaborating nourishment and support for the animal world. And these beautiful relations do the two great organic kingdoms ever maintain with each other. Each consumes only what the other rejects, and furnishes what the other demands. Plants, then, may be considered as the great providers or caterers of the world. They are the *only* Producers; for the whole animal world are only consumers of the nutritive elements which they alone have power to elaborate.

307. EXHALATION is that process by which the superabundant or hurtful elements are thrown off. It is to be distinguished from *evaporation*, which depends solely on the heat and condition of the atmosphere, and which, as you have seen, is almost wholly restrained by the epidermis of plants; and it has a strong analogy to *perspiration*, in the animal system. Exhalation is maintained chiefly, if not entirely, by the action of the stomata; and as these are only open under the influence of light, it follows that a plant can support this important function only in the daytime, or in the presence of light. These facts are shown in several ways. If, under the influence of a bright sunshine, and a still, warm air, a

cold plate of glass be held before the *under* surface of any leaf whose exhaling power is great, as the Annual Sunflower, or Hydrangea, it will soon be covered with dew; but if held before the upper surface, it will remain dry. The stomata, you will remember, are chiefly in the lower surface of the leaf; and this shows that there is an absolute connection between them and the property of Exhalation, as also does the following. If the light be suddenly excluded from an actively growing plant, exhalation will immediately cease; while the stomata, if examined directly on its readmission, will be found closed.

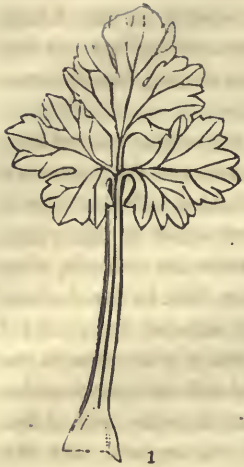
308. The amount of liquid exhaled by plants is frequently enormous. By various experiments, it has been shown that they often perspire from eight to sixteen times as much as the same extent of surface in the human body. A plucked leaf of the Sunflower, with its petiole immersed in water, absorbed and exhaled *its own weight* in six hours.

309. Exhalation by the leaves must always, in a healthy state, maintain a certain proportion to the absorption of the roots. If the former exceed the latter, there is a waste of vital power, and consequent exhaustion. In the spring, before the leaves appear, and while the roots are most vitally active, the absorption by far exceeds exhalation, and the stem is gorged with sap, which will flow readily from an incision. A large portion of this is expended in the production of leaves, after which a continuous supply is demanded to support the growth of the plant. Then the two forces are nearly in equilibrium. Later in the season the vitality of the leaves is impaired, and in autumn they fall and perish. But still the roots remain active for a time; and the excess of nutriment, beyond what is required to maintain a feeble circulation, is again accumulated in the system for future supplies. This may be seen in the swelling of buds during a period of warm weather late in winter. And thus the processes of vegetable life go on, with their continual round of changes, while acquisition, development, growth and rest, are happily maintained.

310. RESPIRATION.—This has been considered by some authors as a function of the vegetable being. But the whole process that has been so termed, must be referred back to that which has just been considered under the head of Digestion. The theory was founded chiefly on the assumption that plants uniformly evolve carbonic acid gas in the absence of light. This, in all cases of

What are the Nourishers of the world? What the consumers? What other wonderful result? Next function, define. From what distinguished? What analogy? By what maintained? What effect of the epidermis? When is Exhalation supported? Why? Stomata. What effect of light? How shown? The

experiment, its philosophy. Liquid exhaled by plants—quantity. Sun-flower. To what should Exhalation always correspond? How is it in the spring? What becomes of the excess? How later in the season? In autumn. What does swelling of buds show? Do plants respire? On what was the theory founded



General subject. Define the word. How is the leaf in its absence? How is the organ at fig. 1—fig. 2—fig. 3? What great Order represented in fig. 4, and how is the petiole? How is it at fig. 6—fig. 5? Into what is the petiole developed in figs. 8 and 9, and what plants do they distinguish? Describe the peculiar habit in fig. 8—fig. 9. What peculiar form of the petiole in fig. 7? What great tribe of plants does it mark—where found? What peculiar habit? What does fig. 12 represent? Describe its structure. What peculiarity in fig. 10?

growing plants, must be very slight; for the amount of growth in any plant may be correctly estimated by its *evolution* of oxygen, and *consumption* of carbonic acid, since only by these processes can it form the material of its tissues. And that plants do grow in the night is absolutely certain, as we see in the case of Mushrooms, and many other plants; and by just so much as they actually *grow*, they consume and appropriate carbon. The textures, however, which are produced in the long-continued absence of light, differ, in wanting the firm consistence and green color, from tissues which are formed under its invigorating influence, as you may see in the familiar fact of Potato sprouts growing in the cellar, the texture of which is always white and spongy.

311. It is quite possible that when the stimuli of heat and light in the solar rays, are withdrawn, the vital powers being passive, the chemical forces assert their sway, and thus a partial decomposition of the forming tissues occurs, in which case there would be necessarily a slight evolution of carbonic acid gas, which is always a result of decomposition.

312. But it is still more probable that the unappropriated carbon which has last been taken up, in the absence of light, and consequent relaxation of the system, cannot be retained, and thus is permitted to escape. It is not known that darkness has any effect on the *absorption* of carbon, and probably it has not. But it can, at least, be said, that what has been termed Vegetable Respiration is not, like that of the animal, established on uniform laws, and essential to the life and health of the plant.

313. There is one remarkable difference between the constitutions of the Vegetable and Animal, which has an important bearing on this part of the subject. The animal tissues, *in their whole substance*, retain their vitality after completion, and continue to *LIVE during the life of the animal*. Hence, in order to repair the waste and wear of vital action, the substance of these tissues must be continually renewed by nutriment, deposited interstitially through their whole substance; while the worn-out particles which the new materials displace, are consumed and thrown off in respiration, by means of which a *combustion* and excretion of the decomposed substances of the old fabric are constantly maintained. Breathing, let it be here understood, is nothing but a burning up and casting out of exhausted particles in the

animal body. On the other hand, but a very small proportion of the vegetable tissues is ever in a really living state at any given time. They begin to lose their vitality almost as soon as they are completed (33), and become concrete substances.

314. There is, in the Vegetable constitution, nothing like the decomposition and recomposition, which constitute the fundamental law of life in the animal body. We conclude, then, by the analogy of Use, which in the works of the Supreme Intelligence everywhere prevails, that there can be no such function as Respiration in the Vegetable system, simply because there is *no use for it*, nothing for it to do; and more, there is no superfluous material for it to act upon. It would be charging the Creator with want of wisdom and economy, and at the same time involve an absurdity, to suppose that He would set a piece of organism to work without reason, or could sustain it without means.

DURATION OF LEAVES.

315. The different periods of fall in the leaf are distinguished by particular names. Leaves are

(1) **DECIDUOUS**, when they last but one season, as in most of our trees and shrubs;

(2) **FUGACEOUS**, when they fall very early, or before other parts of the plant, as in *Spiranthes*; and

(3) **PERSISTENT**, when they remain through the periodical drought of the tropics, and the cold season of temperate climes, or until their loss is supplied by a new growth, so that the tree is never without leaves, as in *Evergreens*.

316. The leaves of deciduous trees are developed about the same period, and they also perish nearly at the same time. The leaves of Pines, Firs, and some other evergreens, are only partially renewed from year to year, by the protrusion of a certain portion of new leaves, and the fall of others, so that there are often on the tree at the same time the leaves of from two to eight or ten successive years.

317. **DECAY AND FALL OF THE LEAF.**—It will be remembered that in the progress of growth, the older tissues often have their cells coated internally with foreign substances, which have been termed the Secondary Deposit (38), and that thus their walls become greatly thickened, and their vitality impaired.

318. There is a tendency in all living bodies to cast

How may the amount of growth in a plant be measured? What gas do growing plants consume—what evolve—in what measure? How are plants grown in the dark? What familiar example? What theory at 311? What more probable? What may be said in regard to Vegetable Respiration? What tissues retain their vitality after completion—what do not? How are the animal tissues—how deposited—how consumed and thrown off—what effects

produced? Vegetable Tissues—explain the difference. Why may we suppose that Plants do *not* Respire? Why *should* they not? Why *can* they not? Duration of Leaves—when they last one season—many seasons—fall very soon. How are the leaves of our forest trees—of Pines? Decay and Fall of the Leaf—Secondary Deposit—what effect. What tendency in all living bodies?

off inert or dead matter, with a force proportioned to their degree of vitality; or, in other words, Life, being the positive and active principle, continually asserts its power, by rejecting dead substances which are only passive and negative. Thus dead flesh is thrown off by the animal body, in the ulceration of a sore; diseased bones are rejected, and dead hair and teeth are cast off, in the vital action of a new growth. Keeping this principle in view, you will be better able to understand the exciting cause of falling in the leaf, which is often only a kind of sloughing, or casting off of worn-out garments.

319. Early in the season, often in the freshness of the spring-tide leaf, there is a faint line to be traced round the base of the petiole. This is caused by the formation of a joint between the base of the leaf-stalk and the stem, or branch, on which it stands; and as the season advances, it becomes more strongly marked. In a transverse layer of cells which follows this line, the substance becomes decomposed by the vital action of the forming articulation, which the Leaf, with its diminishing vitality, cannot resist. And thus cell by cell it is cut off, and finally drops to the ground. This may be seen by examining the petiole of fallen leaves, which often appear to be cut off as smoothly as if the operation were performed with a sharp knife.

320. That the fall of the leaf is not caused by frost, nor by the actual death of the leaf, and also that when the leaf dies it will not necessarily fall, may be shown by several facts. In the great Plane or Buttonwood tree, the bud of the next year is formed within the leaf-stalk of the present; and thus the fall of the leaf is caused directly by its protrusion. The leaves of some species often turn red, and sometimes fall, before the appearance of frost; and when young leaves are killed by frost in spring, they do not fall, but decay and wither on the trees, because there are then no articulations formed, and no protruding buds to effect a separation. Palms, and most Endogens, never exclude their old leaves, because they are not articulated with the stem, as in those of Exogens; and their remains continue hanging about the tree long after the appearance of the new leaves, or until they are corroded by the elements, and fall away by atoms. This is also, in some degree, true of the Beech and Oak, their leaves often remaining through the winter, and until they are pushed off by the expanding buds in the spring.

Instances. What may the fall of the leaf often be termed? How is the leaf detached? Describe the operation. What facts show that the fall of the leaf is not caused by frost, nor by death? How does the Plane reject its leaves? Why do not Palms reject theirs? How are the Beech and Oak?

General subject. Elementary constituents—of how many kinds? Name

CHAPTER XXII.

THE FOOD OF PLANTS.

321. THE elementary constituents of plants are of two kinds, as you have already learned; namely, Organic and Inorganic. Carbon, hydrogen, oxygen and nitrogen which are termed the *universal organic constituents of plants*, because they enter more or less into all organism, compose the first; and certain earthy or mineral matters, the second. The completed tissue is made up of the three first, nitrogen, or, as it is sometimes called, azote, being introduced only as an agent in the vital action of the cells, or as a deposit in their granaries, but never fixed in the structure. As these four elements are universal, it follows that the distinguishing characteristics of plants must be traced to the inorganic elements which enter into their composition; and so it is.

322. COMMON SOURCES OF FOOD.—Of the four elements which enter into the composition and vital movements of all plants, carbon constitutes from fifty to sixty per cent. of the whole structure. This enormous amount, which thus supplies and saturates all vegetative nature, is drawn, either directly or indirectly, from the atmosphere. Oxygen and hydrogen are furnished by rain-water; and nitrogen is obtained chiefly in the form of ammonia.

323. PARTICULAR SOURCES OF FOOD.—But while the organic elements have always maintained their due consequence among scientific Botanists and Cultivators, the importance of the Inorganic elements has not been appreciated. These are chiefly composed of Potash, Soda, Lime, Phosphoric Acid, Sulphuric Acid, Magnesia and Silica, or sand. These, and some others, may be termed the *particular*, or *INDIVIDUAL CONSTITUENTS* of plants; and they are drawn from the soil. To determine of what kind, degree, and in what proportion, the inorganic elements are combined in any plant, we have only to analyze the ashes which it deposits in burning. Thus we arrive at certain conclusions, in regard to the kind and degree of food that should be supplied; for the inorganic elements which, in a healthy or natural state, are taken up into the tissues, should not only be present in the soil to which the seed of any species is consigned, but they should be present in precisely the same proportions they have in the healthy plant.

324. Liebig, the great German Chemist, has made many experiments in these mineral constituents of the

the Organic elements—which are deposited in the structure—which is the vital agent? What proportion of carbon—from what source—oxygen and hydrogen—nitrogen? What class of elements have been neglected? Of what are these chiefly composed—what termed—what analysis—for what purpose—what result? What should be present in the soil? What great experimenter?



General subject. Define the term. What is the normal or common condition? How is it at fig. 2—fig. 6—fig. 5: and what plants are represented? How is it in the great Plane-tree—and what figure in the plate represents a similar form? What are the stipules called in such plants as fig. 7—and what tribe is represented by the figure? How are they in the Grasses, fig. 10—in the Low Cornel, fig. 8—and in fig. 11? What may the sheathing process in the Fennel tribe, fig. 4, be termed? Which figure represents the Ligule—Ochrea?

vegetable body, with a view of arriving at more just and certain laws in agricultural operations. He classes cultivated vegetables under four heads, namely:

(1) ALKALI PLANTS, represented by Potatoes and Beets;

(2) LIME PLANTS, represented by Clover and Peas;

(3) SILEX PLANTS, represented by the Grasses;

(4) PHOSPHOROUS PLANTS, represented by Wheat and Rye.

325. But while the organic bases have been abundantly supplied from the organic remains of which manures are generally composed, and which constitute a large portion of the rich, black earth known as *humus*, or pure vegetable mould, little or no attention has been given, to the necessary supply of proper material for supporting the inorganic bases. Let cultivators who now act too exclusively on the forcing system, set aside the old idea, that it is the richness of the soil alone, or chiefly, which will insure good crops. If this is so, why do not bogs, which are exceedingly rich in humus, produce in abundance such plants as affect a moist soil? So far is this from being true, that bogs are very poor in plants; and those they do produce are of the coarsest kinds. If the water which sometimes covers them did not wash away the inorganic elements, leaving little else beside humus, they would produce abundantly many of the plants which now are so rarely found among them. This should teach us that we cannot, by any process of manuring, convert one element into another. We cannot change lime into soda, potash into sand, or humus into either. We cannot make Potatoes, which want potash, or Grasses that call for pure silix, submit to accept of the richest mould as a substitute.

326. Let us, then, by a careful analysis, ascertain the inorganic constituents of plants, and then provide that every species shall have its proper mineral food present in the soil, and ready to be appropriated. The stalks of Grasses, and especially those of the Cereal Grains, could not be formed with sufficient strength to support the ripened head, without a proper quantity of *silix*, however rich in other elements the soil may be; nor could albumen and gluten, which give to Maize, Wheat, and all the cereal grains, their chief value, be elaborated without the presence of phosphoric acid; and

although there is not a particle of alkaline salt in sugar starch and cellulose, neither of them could be produced without the presence of such salts. Thus all plants should have a full supply of the mineral nutriment which their constitution demands. By burning and analyzing the ashes of a healthy plant, it can be ascertained precisely what elements are taken up, and therefore what kinds, and in what proportion, should be supplied. This explains the necessity of a rotation of crops; for the whole secret consists in regulating the condition of the soil to the demand of the crop, or the reverse, in adapting the crop to the soil.

327. The importance of the Inorganic elements may be inferred from the fact, that more than one third of the human body, by weight, consists of *earthy matter*. This must be supplied chiefly through the vegetable portion of its food; for since all animals have bones and teeth to form for themselves, it follows that the mineral matter contained in the vegetable substances on which they feed, would not be deposited so liberally in the flesh, and, therefore, that they can be obtained more abundantly direct from the vegetable tissues, by which alone they are directly transferred to organism. The inhabitants of frigid climes are uniformly small, short, and altogether deficient in the development of bone; and this may doubtless be attributed to their poor supply of vegetable food, and consequently of those substances that furnish the most abundant and best material for the osseous structure.

CHAPTER XXIII.

INFLORESCENCE.

328. HAVING now completed a review of the Vegetative Organs, we come to quite another and a very different class. Yet, however unlike these may appear in external form, texture and coloring, you will find that they all have their origin in the Leaf. This organ is the type of all those above it, from which they always depart, and to which they sometimes return.

329. Still ascending from the Leaf upward, the next thing that arrests the attention is the varied manner in which flowers are assembled on their stalks. This is termed INFLORESCENCE.

His classification—Alkali plants—Lime plants—Silix plants—Phosphorous plants. Instances. What bases supplied from most manures? What *other* bases important—name of rich black mould—of what composed? Why do not bogs produce abundantly all plants that like wet? What exchanges *cannot* be made? What should be done? What required by grass stalks—what to form albumen—what sugar, starch and cellulose—is the alkaline salt taken up by them? What should all plants have? What analysis, and what ascertained by

it? Of what does it explain the necessity? In what does the whole secret consist? Importance of Inorganic elements—from what fact inferred? By what food is the osseous structure chiefly nourished—why not from animal food? Inhabitants of the frigid zone—why small frames?

General subject. What other class of organs? In what do they originate? In ascending from the leaf, what first arrests attention—what termed?

330. One of the component parts of Inflorescence is the Flower-stalk, which is called a PEDUNCLE. When the peduncle is not present, the flower is said to be *sessile*. This organ bears no leaves, or only BRACTS.

331. Like the stem, of which it is a part, the peduncle may be either simple or branched. The axis of a compound peduncle is called the RACHIS, and may be seen in the Lilac, Oat and Currant, figs. 8, 4 and 6, of Plate XX. Its subdivisions are called PEDICELS.

332. A SCAPE is a flower-stalk that springs from a subterranean stem, bearing no leaves, or only minute bracts, as in the Dandelion, and many species of Violet. Such plants were formerly called *acaulescent*, or STEM-LESS, but no plant is now considered to be without a stem.

333. SOLITARY INFLORESCENCE is that in which the cluster is reduced to its simplest form, and contains but one flower. This can happen only in two cases: first, when a simple stem is terminated by a single flower, and all further growth is consequently arrested, as in the Dog-tooth Violet; and secondly, when but a single flower is developed from each node, as in the Chick-Pea, a native of Southern Europe.

334. In respect to the order of the evolution, Inflorescence is of two principal kinds—the CENTRIFUGAL, in which the terminal flower is first unfolded, and the blossoming proceeds *outward*, as in the Elder and Pink tribes; and the CENTRIPETAL, when the outermost, or lowest flower is first open, and the evolution proceeds *toward the centre*, as in the Fennel and Cress tribes. The first of these is called DETERMINATE INFLORESCENCE, because the central flower stands in the place of the terminal bud, and always terminates the axis of growth, as in fig. 1; and the second is called INDETERMINATE INFLORESCENCE, because it is entirely axillary, or each flower proceeds from an axil between the leaf and the stem, and the primary axis is never terminated by a flower, as in fig. 2. Sometimes both these modes are combined in the same plant, as in the Aster, Burdock, and the great Order Compositæ generally, and also in the Mint tribe, to which the Lavender, Sage and Pennyroyal, belong. In the first, the inflorescence of the single head is developed centripetally, while that of the whole cluster proceeds centrifugally; that is, the outermost flowers in the head expand first, and the blossoming proceeds inward, while the highest heads are first unfolded,

and the general evolution proceeds outward. In the Mint family, this order is exactly reversed; the inmost flowers, and outermost or lowest clusters, always taking the lead.

CENTRIPETAL INFLORESCENCE.

335. The principal varieties of this mode are the Spike, Raceme, Corymb, Panicle, Ament, Spadix, Umbel, Head, and Thyse.

336. THE SPIKE is formed by the production of numerous sessile flowers on an elongated rachis, as in the Plantain, and the Darnell grass, fig. 9.

337. THE RACEME is a spike with the flowers arranged on pedicels, as in the Currant, fig. 6.

338. THE CORYMB has the same general law of arrangement as the raceme, but the lower pedicels are elongated, so to form a flat or flattish top, as in the Yarrow, fig. 3.

339. THE PANICLE is a loose, irregular cluster, combining the characters of a corymb and raceme, and is, in fact, a kind of branching spike. The Oat, fig. 4, is a familiar and beautiful example.

340. A THYRSE is a more compact arrangement of the panicle, and generally has a somewhat ovate form, as in the Grape and the Lilac, fig. 8.

— 341. When the inflorescence is compound, two or more of these forms are combined; and they are expressed by a similar combination of terms, as, panicles *thyrsoid*—Racemes *corymbose*—Spikes *panicled*, and the like. The species of Grass at fig. 7 has a compound inflorescence of the latter form.

342. AN AMENT, or CATKIN, is a spike with sessile bracts interposed among its flowers, as in the Walnut and Willow, figs. 2 and 7, Plate XXI. A large number of our forest trees have this form of inflorescence.

343. THE SPADIX is a spike with a greatly thickened, club-shaped rachis, surrounded by a single bract, called a *spathe*, as in the Calla and Palm tribes. At fig. 9 is seen the *spadix*, with its two kinds of flowers, the fertile ones being included in the lower whorls; and at fig. 10 the spadix is inclosed by its *spathe*, as in the American Calla.

344. THE UMBEL is formed when all the stalks radiate from a common centre, like the rays of a star. It is *simple*, when each of the pedicels bears a single flower, as in the Milk-weed; and *compound*, when each of the flower stalks bears a smaller umbel, as in the Dill, fig. 5.

What component part—its name—when not present—what leaves does it bear—axis of a compound peduncle—its divisions? Define Scape—Solitary inflorescence. Two principal forms of Inflorescence. Define the Centripetal—Centrifugal—which is termed Definite—which Indefinite? Why? How is the primary axis in the Centrifugal mode—the Centripetal? Order of evolu-

tion in the Compositæ—in the Mint tribe. Forms of Centripetal Inflorescence. Define each, with examples. Centrifugal forms—Define. Examples. Difference between the Thyse and Panicle, the Raceme and Spike, Fascicle and Corymb, Cyme and Umbel.



General subject. Define the term. Name each figure. How is the Bract in the amentaceous trees—in the Sun-flower tribe—in the Fennel tribe—in the Grasses? When the bracts inclose many flowers what are they called? What figures in the plate represent the Involucre, and to what tribes do they belong? What corresponds with the involucre in Grasses, and what are the parts that inclose the single flower? How are the bracts in fig. 6—fig. 8—fig. 9? What do they form in fig. 11—fig. 12? What peculiar form at fig. 13? What are represented in figs. 4 and 5?

345. A HEAD (*capitulum*) is a more or less globular arrangement of the flowers, as in the Clover and the Button-bush, fig. 4. Neither the primary nor secondary axes are elongated in the head. This form of inflorescence is often surrounded by a cluster of bracts called an involucre, as in the Marigold, fig. 1, which belongs to the Order Compositæ, embracing the Compound Flowers of the old Botanists. Here we find a peculiar mode of inflorescence. The rachis is expanded into a broad disc, called the Torus, or Receptacle, as may be seen in the Dandelion, Aster, Thistle, or any of the flowers in this numerous family.

THE CENTRIFUGAL FORM.

346. This is generally to be distinguished by the presence of a single flower at the termination of the primary axis and its forked branches. The principal forms of the Centrifugal mode of inflorescence are, the Cyme, Fascicle, and Verticillaster.

347. THE CYME externally resembles an umbel in the primary arrangement of its stalks, which all radiate from a common centre, but differs from it in their secondary distribution, by which they are irregularly subdivided, the branches being repeatedly two or three forked, the whole forming a level, or nearly level top, as in the Elder, which, however, is not very well represented in fig. 8.

348. THE FASCICLE is an arrangement of the Corymb, in which the flowers are crowded or bundled together, as in the Sweet William, fig. 3.

349. THE VERTICILLASTER is the inflorescence of the Mint tribe; and though often called a *whorl*, it is not so, since the flowers do not actually surround the stem, but occupy opposite points in the axils of each pair of leaves. The only true verticil, or real whorl of flowers, is found in plants with whorled leaves, as the Water-Milfoil. The verticillaster is seen at fig. 6.

350. BRACTEOLES are the smaller bracts often found on the branches of the inflorescence; but though it is often necessary to distinguish between these and those that grow at the basis of the primary branches, there is no absolute distinction between them, other than that of position.

CHAPTER XXIV.

ORGANS OF REPRODUCTION.

351. A TYPICAL, or complete flower, consists of the Essential Organs, or the STAMENS and PISTILS, and their ENVELOPES. The first are called *Essential organs*, because they are NEVER WANTING, as no flower can be perfected without them; and the last, in their normal state, consist of two sets of leaves, remarkably different from each other in form, color, and texture. The Floral Envelopes are, therefore, exterior to the stamens and pistils, which in the bud they inclose, and after expansion, shelter and protect. These are generally of two kinds, occupying two distinct circles, one of which is above or interior to the other. The lowest or outermost of these is called the CALYX; the upper, or inmost, the COROLLA. But when only one whorl is present, it is classed among calyx forms, whatever may be its character, and is then usually termed a PERIANTH (*around the flower*). The parts or divisions of the Calyx are termed SEPALs; those of the Corolla, PETALS.

352. Occupying the next circles within the corolla, come the STAMENS, or FERTILIZING ORGANS.

353. THE PISTILS, one or more, stand in the centre of the flower, and thus terminate its axis of growth. They are inclosed by the stamens, and are called the FERTILE, or SEED-BEARING ORGANS.

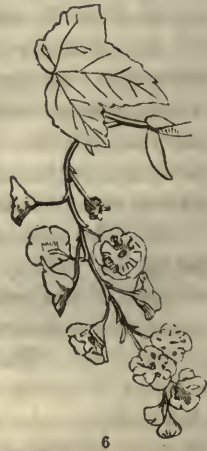
354. A COMPLETE FLOWER, then, consists of these four whorls—the Calyx, the Corolla, the Stamens, and the Pistils; and they all, either directly or indirectly, are seated on the Torus out of which they grow.

355. Such is the structure of a complete flower; but from this type there are many variations, the most important of which is the separation of the stamens and pistils, which sometimes grow in separate flowers. In the Hickory, fig. 2, the staminate flowers occupy the ament *a*, and the solitary pistillate flower is seen in the little nutlike body, with its small clusters of transformed leaves, near the summit of the branch. At other times they are still more widely separated, occupying not only different flowers, but distinct plants, as in the Poplar, Fig, Palm, and Willow trees. The symmetry of the flower is also frequently destroyed by the abortion or suppression of some of its parts or whorls. This often happens with the calyx and corolla.

Spike and Ament? Describe the inflorescence of the Compositæ. What were the plants of this Order termed by the old Botanists? How is the *rachis* in this tribe—its name?

General subject. Of what does the Complete Flower consist? How many Floral Envelopes? Are they *essential*? What is the lowest or outermost whorl named—the next? Name the next circle within the Corolla—the next.

Which is the central whorl? Which of all these groups are essential? Define stamens—their position and office—Pistils. Most important variation from this type—how caused? How are the stamens and pistils in the Hickory tribe—in the Palm tribe? How many whorls of Floral Envelopes in the typical flower? When but one whorl is present, what is it called? How many whorls in all? Name and define their true order.



General subject. Define the word. Name of the common peduncle—its sub-divisions. What two principal forms of Inflorescence represented in figs. 1 and 2? How does the evolution of flowers proceed in fig. 1—what synonym is sometimes used—for what reason? In fig. 2—is this Centripetal or Centrifugal? Why? To which of the two principal forms do the remaining figures in the plate belong? What difference between figs. 4 and 8—6 and 9? What form of Inflorescence in fig. 7?

356. All these floral organs, unlike as they are to each other, and to the common Leaf of the plant, are yet only varied transformations of that organ. That they are really *transformed leaves*, is clearly shown by several well-known facts. The transition from common leaves to sepals is generally very clear; while that from the sepals to petals is, in many flowers, equally obvious, and especially in those where there is a colored perianth, as in the Tulip, and others of the Lily tribe; certain parts of the divisions being almost always marked with the green color and texture of the calyx, while the remainder exhibit the brilliant colors and finer texture of the corolla.

357. By excessive nutriment in cultivation, and other unnatural stimuli, the stamens, and often the pistils, are changed to petals, producing what are called **DOUBLE FLOWERS**. The Rose, Hollyhock, Peony and Dahlia, are familiar instances; and in these flowers you may often see the various stages of transition; for you will always observe, as you approach the centre of the flower, that the petals become narrower, and exhibit various foldings, until, by almost imperceptible changes, they pass into the stamens and pistils. Thus you will find by observation, that *metamorphoses*, or interchange of forms are of frequent occurrence in the Floral world.

358. The most common of these transformations is that of the stamens and pistils into petals. But not unfrequently the order is reversed, and the transformed organs show a more decided inclination to revert to their primitive type. The Rose sometimes produces a second bud from the bosom of its flower. The Mourning Bride often exhibits like deformities, putting forth from its expanded blossom a stalk, with the flower and all its parts, though not often colored like the first. The production of a *leafy branch* is not very uncommon in the flowers of the Apple and Pear; and even the **FRUIT** of the latter, when the transformation had reached its last remove, has manifested a sudden resolution to return to the original type, in the production of a leafy branch from its summit. In all these cases, there is an obvious effort to continue the axis of growth. The flower of the Clover, and some other plants, will put forth green leaves from its petals; and in the Double-flowering Cherry, the pistils often revert to leaves. But these changes are innumerable. Enough has been said to show that there is no

absolute line of distinction between their elementary conditions, since they must have one common origin, or they would not, and could not, all revert to one common type.

359. Nothing, perhaps, has ever impressed the young student with a higher degree of wonder than the continual occurrence of *the same number* in any particular part of a flower. Thus, if any given flower has five, or ten, or four stamens, millions of individuals of the same species, almost as a matter of certainty, will have the same. We go on, finding yet more complex principles of arrangement, exhibiting a mathematical uniformity; and thus we are led to seek for **LAWS**, to which external facts must be subservient. Finding so general a uniformity of numbers in the *same* parts of a flower, we begin to compare the *different* parts; and here, although they are not often perfectly uniform, yet there is always a determination to certain numbers; and this fact points to a perfect type, which may have been disturbed by some accident, and, by a recurrence of the same circumstances, has been inherited, or perpetuated in the species. There is a certain symmetry often observed in flowers, when their several whorls present the same numbers, or multiples of the same, as in the Flax, which has five sepals, five petals, five stamens—with the rudiments of five undeveloped ones—five pistils; and its seed-vessel is five celled. But there are several causes which disturb this symmetry, so that in very few cases the relation of number is complete. The principal of these are Abortion, Suppression, Coalescence, Adnation, Chorisis, Regular Multiplication, and Irregularity of Form.

360. **ABORTION** is the *imperfect development* of any part, as in the sterile stamens of the Parnassia.

361. **SUPPRESSION** is the *entire absence* of any part; as in the nondevelopment of the fifth stamen in the Fig-wort tribe.

362. **COALESCENCE** is the union of parts in the *same whorl*, as that of the stamens in the Pea and Sun-flower tribes.

363. **ADNATION** is the union of parts of *different whorls*. It gives the appearance of one organ growing out of another, instead of its normal basis the receptacle, as when the stamens appear inserted on the corolla, or growing out of the pistil, or the calyx is adherent to the corolla. When all the several whorls occupy their true

Of what are all these organs transformations? Most common of these. How are the essential Organs in **DOUBLE FLOWERS**? Describe the transitions, and give examples. What of common occurrence? Which are the Essential Organs? Why so called? Instances of reversed transformation. What effort does all this indicate—what does it show? Why? What gives an impression of wonder? What do we go on finding—what led to seek—what in the same

parts—what compare? What general laws of symmetry observed? Instance of complete symmetry. Is this common? Principal causes that disturb symmetry. Define Abortion, Suppression, Coalescence, Adnation, Chorisis, Regular Multiplication, Irregularity of Form. Difference between Adnation and Coalescence—Abortion and Suppression. When are the stamens and pistils generally regular and symmetrical?



General subject. Name each figure. Where are the staminate flowers in fig. 2—the pistillate flower? Difference between figs. 5 and 8? What kind of inflorescence at figs. 9 and 10? Is there any perfect verticill in this plate? What is the arrangement at fig. 6? What two Forms of the Head—and in what plants? Is the Umbel at fig. 5 simple, or compound? What are its subdivisions called? What arrangement at fig. 11? Which of these figures develop their flowers centripetally—which centrifugally?

places on the receptacle, the calyx is below, or outside of the corolla, the corolla of the stamens, and the stamens of the pistils. The floral organs are then said to be *FREE*, in opposition to that state where their insertion is obscured by the adhesion of two or more whorls.

364. *CHORISIS* is an irregular multiplication produced by a *division of parts*, as in the order *Cruciferae*, where each of the external pair of stamens is supposed to be formed by the division of one.

365. *REGULAR MULTIPLICATION* is the production of two or more whorls in the place of one, as in the *Pond-Lily* and *Magnolia* tribe, where the petals are thus multiplied, and in the *Rose* and *Crow-foot* tribes, where the stamens and pistils occupy several whorls.

366. *IRREGULARITY OF FORM* occurs *when the parts of the same whorl are unequally developed*, as in the corolla of the *Violet* and the *Pea*, and the stamens of the *Cress* tribe. If the perianth is regular, the stamens are generally regular and symmetrical; but they have a strong determination to be unsymmetrical when the floral envelopes are so.

367. When both whorls are present, the floral envelopes almost always, and the stamens generally, preserve their true numerical relations; but proceeding inward, the floral whorls have less and less room for expansion, until in the pistils, or central whorl, the base often becomes contracted to a mere point; and thus the several members are either fairly crowded out of place, or the adjacent parts coalesce, and form a single, or perhaps a double organ, in the place of several.

368. A flower whose parts are in twos, or multiples of two, is called *DIMEROUS*, threes, *TRIMEROUS*, fours, *TETRAMEROUS*, and fives, *PENTAMEROUS*. The first number is rare. *Monocotyledonous* flowers are *almost always trimerous*; and a large proportion of the *Dicotyledonous* are *pentamerous*. The whorls of the latter are less frequently in fours, and seldom in twos. As a general thing the number three marks the divisions of the first, and five and four of the last.

369. A *SYMMETRICAL FLOWER* is one whose whorls correspond in regard to *number*.

370. A *REGULAR FLOWER* is one whose parts correspond in *size and form*.

371. A *COMPLETE FLOWER* consists of the *Essential Organs* and their two regular whorls of *Envelopes*.

372. AN *INFERTILE* OR *BARREN FLOWER* is one that contains only *stamens*.

373. A *FERTILE FLOWER* is one that contains only *pistils*.

374. A *PERFECT FLOWER* is one that contains *both stamens and pistils*.

375. The flowers are *POLYGAMOUS* when they consist of *Barren, Fertile, and Perfect* flowers, mingled promiscuously.

CHAPTER XXV.

THE FLORAL ENVELOPES.

376. * *PREFLORATION* is the manner in which a flower lies folded in the bud. The same terms which are used to express *Prefoliation* will, in a general sense, apply to the structure of the flower-bud. The principal forms of *Prefloration* are the *Imbricate*, the *Convolute*, and the *Valvular*.

377. When the floral leaves lap over each other in the bud, like shingles on a house-roof, the *prefloration* is said to be *Imbricated*; and the same term is applied to other parts. In the diagram, fig. 1. Plate XXII., this form is shown, the divisions being arranged in a spiral line from 1 to 5. This, however, is not the most common arrangement; for when the parts are in fives, as in the *Rose* and *Apple*, there will be two outer and two inner, while the fifth division is exterior by one edge, and interior at the other. Another form of the *imbricated* *prefloration* is seen in flowers with four parts, when the two opposite divisions will be external, as in fig. 2. At fig. 3 the *prefloration* is such as occurs in flowers like that of the *Pea*, and is called *Vexillary*; 1 and 2 are the *wings*, or side petals, 4 the *banner*, or large upper petal which becomes external, and 3 and 5 parts of the *keel*, or lower petal.

378. THE *CONVOLUTE PREFLORATION* appears to be caused by the twisting of the several parts on their axis, one edge being directed obliquely inward, while the other overlaps its successor, as in the diagram, fig. 4. A variety of this form occurs in *Monopetalous corollas*, as in the *Morning-Glory*, which is not only twisted, but plaited in the bud. Such *prefloration* is *SUPERVOLUTE*.

* *Æstivation* is the term generally used to express the folding of the Flower in its bud, and *Vernation* that of the Leaf; but I prefer *Prefloration* and *Prefoliation*, as being truer to the facts, since Leaf-buds do not belong exclusively to spring, nor Flower-buds to summer.

Which whorls usually preserve their symmetry? In what direction does symmetry decline? Why? What is a flower in twos—in threes—in fours—in fives? Which of these is rare? Which most common? Which distinguish *Endogens*—*Exogens*. Define a *Symmetrical Flower*—*Regular*—*Irregular*—*Barren*—*Fertile*—*Perfect*. How when *Polygamous*?

General subject. Define the term. What synonyms generally used? What corresponding terms may be applied? Three principal forms. Define *Imbricated*—other forms. Name the outermost whorl of *Envelopes*. Define the name. When but one whorl is present, what is it called?



General subjects. Define each. Name the figures from 1 to 5. What flower-buds are folded in the form of fig. 3—what like fig. 2? How are the parts arranged in fig. 1? How is the Prefloration of the Rose different from this? What kind of prefloration at fig. 4—fig. 5? What two principal distinctions of the Calyx? How is it at figs. 7 and 8—how in the Compositae—and in what figures illustrated? What is it called in these cases? Name the cluster of leaves that envelope many flowers. In what figures represented? What single leaf inclosing many flowers? What is represented in fig. 14? With what do the large external envelopes which inclose the spikelets correspond? What are they called—the envelopes of the single flowers? Name them. What are their parts or pieces? What figure, and of what flower, represents the common envelope or Perianth? Is the calyx Inferior or Superior at fig. 16—fig. 18? How at base in the latter?

379. When the floral members are arranged in an exact circle, neither being higher nor lower than its fellows, their edges will be applied to each other without overlapping, as in the *Hydrangea* and *Linden*. The form of this mode is shown in the diagram, fig. 5, and is called VALVULAR.

380. In the *Poppy* the corolla is crumpled together; and there are some other, but not important varieties.

THE CALYX.

381. When both whorls of the floral envelopes are present, the outermost is called the CALYX. This name literally means CUP, and refers to the cup-like cavity in which it holds the other parts of the flower, as in figs. 7, 8 and 9. The sepals, or leaves of the calyx, generally exhibit the green color, and coarser texture, of ordinary leaves; but sometimes they are endowed with the brilliant hues, and more delicate organization, which have been supposed to belong exclusively to the corolla.

382. ELEMENTARY COMPOSITION.—The anatomical structure of the proper calyx is identical with that of the ordinary leaf, the pulpy expansion being composed of parenchyma, and the framework of woody or fibrous tissue, but when it is colored, chromule (66) is developed instead of chlorophylle, and the whole texture is finer and more delicate. The sepals are sometimes distinct; but they more frequently cohere by their edges, as in the *Rose*, when the calyx is called MONOSEPALOUS; yet strictly speaking, no calyx can be said to be composed of a single leaf.

383. A very important generic distinction is drawn from the position of the calyx in regard to the OVARY, or hollow part of the base of the pistil, containing the OVULES, or eggs of the plant, which are the rudiments of the seed. The calyx is

(1) INFERIOR, when it is *free*, or distinct from the ovary, as in the *Tobacco* and *Campion*, figs. 7 and 8, and also in fig. 16; and

(2) SUPERIOR, when it adheres to the ovary, as in the *Bell-flower*, fig. 9. Thus when the calyx is inferior, the ovary is superior; and the reverse.

384. Sometimes the sepals are in two circles, or whorls, as in the *Strawberry*, fig. 19. The outer and smaller divisions of such a calyx are called BRACTEOLES.

385. The dry and membranaceous envelopes which inclose the spikelets of flowers in *Grasses* are called

GLUMES; and they correspond with the Involucre. Those which immediately inclose the single flower, are termed paleæ, the parts or pieces of which, usually two, are VALVES. At fig. 14 is a spikelet of the *Oat* with its glume, *gl*, its paleæ, *pe*, which correspond with the floral envelopes, calyx or corolla, and an abortive flower at *fs*. The largest palea has a stout awn, *a*.

386. Sometimes the calyx is reduced to a cluster of hairs surrounding the florets of a compound flower, as may be seen in the common *Groundsel*, fig. 11, which is invested by its hairy envelope, called the PAPPUS. At fig. 6 is the pappus of the *Dandelion*, which is borne on a stalk, or *stipe*. There are several forms of pappus which afford specific distinctions in this large and difficult Order. They are

(1) PILOSE, composed of simple hairs;

(2) PLUMOSE, when each hair is feathered, or fringed with smaller hairs;

(3) SETOSE, when the hairs are stiff or bristly; and

(4) PALEACEOUS, when dilated so as to become chaffy.

387. When the outer envelope incloses many flowers, it is called an INVOLUCRE. Sometimes the involucre is composed of green leaves, and resemble a calyx, as in the *Marigold*, fig. 12, and the *Fennel*, fig. 15, as well as in all the two great Orders which those plants represent; at others it is brilliant, delicate, and petal-like, as in the *Low Cornel*, fig. 17. The SPATHE, as seen in the *American Calla*, fig. 10, is a kind of involucre. Sometimes the spathe is exquisitely delicate; and it always constitutes the chief beauty of the flower. In the *Fennel* tribe, fig. 15, the division which incloses an umbellet, or partial umbel, is called an INVOLUCEL, while the bracts which are situated at the base of the compound umbel, and inclose the whole inflorescence, are called the GENERAL INVOLUCRE. In the *Wall-flower*, fig. 18, and other plants of its family, the calyx is swelled out at base, and is said to be gibbous.

THE COROLLA.

388. ELEMENTARY COMPOSITION.—As the two sets of floral envelopes are at times indistinguishable, there can be no absolute difference of anatomical structure, only that a superior degree of fineness and delicacy is found chiefly in that form which is, by contrast with the coarser and outer whorl, termed the COROLLA.

389. The parts of the corolla, like those of the calyx, are sometimes confluent. When this happens the flower

Define the name. Divisions of the Calyx. When the sepals cohere what is it? Is the term proper? What important generic distinctions? Define each position. When the Ovary is below how is the Calyx—how in the reverse? Is the Inferior Calyx *free* or *adherent* to the Ovary? The Superior? When the sepals are in two whorls, what are the smaller? Define Ovary—Ovules. Calyx of

Grasses. Describe. With what do the outer envelopes correspond—the inner? Name of the first—of the second. How many parts usually—what termed? Instance. How is the Calyx in the Composite—its name—stalk of the pappus? Forms of pappus. Define each. Elementary composition of the next whorl. Its name. What are the divisions called? When they are confluent how is the corolla?



General subject. Name each figure. Which of these forms are Monopetalous—Polypetalous? Point out the parts in figs. 1, 2, and 6. Parts of fig. 9. What kind of Corolla at fig. 8? By what fruits accompanied—what Order does it mark—from what circumstance? What kind of Corolla at fig. 13—what are some of its fruits? Describe fig. 14. Define its parts—its fruits. How does fig.

8 differ from 4—fig. 1 from 5? How is the limb in the Rotate corolla—the Bell-form—the Funnel-form—the Tubular? How many petals, and how arranged in the Cruciform—the Rosaceous—the Liliaceous—and the Caryophyllaceous forms? What kind of Corolla at fig. 14? Name its upper petal—the side petals—the lower.

is said to be **MONOPETALOUS**. If the parts remain distinct, the corolla is called **POLYPETALOUS**. In strict language there is no such thing as a monopetalous corolla; but the terms are used to express a flower of one or more *apparent* divisions, for convenience, and for want of better forms.

390. The parts of a monopetalous corolla are

(1) **THE TUBE**, or hollow cylinder, as seen at *t*, fig. 1, Plate XXIII.;

(2) **THE THROAT**, or opening of the tube; and

(3) **THE LIMB**, or expansion of the tube into a border, as at *l* in the same figure.

MONOPETALOUS FORMS.

391. The principal of these are the **Salver-form**, the **Rotate**, the **Campanulate**, the **Funnel-form**, the **Labiata**, and the **Tubular**.

392. **THE SALVER-FORM** (*Hypocrateriform*) is so called because it resembles an ancient drinking-glass. It has a long tube expanded into a conspicuous border, as in *Phlox* and the *Tobacco*, fig. 1.

393. **THE ROTATE** (*wheel-form*) corolla has a very short tube, with five well defined segments, or divisions of the limb, as in the *Mullein*, fig. 7.

394. **THE CAMPANULATE** (*bell-form*) corolla has the tube gradually expanding into a bell shape, as in the *Harebell*, fig. 6.

395. **THE FUNNEL-FORM** (*infundibuliform*), after a gradual enlargement of the tube, suddenly expands into a spreading border, as in the *Morning-Glory* and the *Petunia*, fig. 2.

396. **THE LABIATE-FORM** (*having lips*) has a more or less expansive and deeply cloven tube, with its segments swelling outward, so as to bear a strong resemblance to the mouth of animals. Of this form there are two varieties—

(1) **PERSONATE**, with the *throat closed*, as in the *Snapdragon*, fig. 3; and

(2) **RINGENT**, with the *throat open*, as in fig. 4. The last form distinguishes the *Mint* tribe.

397. In the **TUBULAR** form, the corolla is drawn out into a long tube, with very little expansion, as in some species of *Honeysuckle*, one of which is seen at fig. 5.

POLYPETALOUS FORMS.

398. When the petals remain obviously separate, the corolla is **POLYPETALOUS**. A petal has two parts—

(1) **THE LAMINA**, or expanded portion, as at *l*, fig. 9; and

(2) **THE CLAW**, or part by which it is inserted, as at *c*, in the same figure.

399. The principal forms of the polypetalous corolla are the **Cruciform**, **Caryophyllaceous**, **Rosaceous**, **Liliaceous**, and **Papilionaceous**.

400. **THE CRUCIFORM** corolla consists of four petals in the form of a cross, as in the *Wall-flower*, fig. 8. A large natural Order, *Cruciferae*, has its name, and is chiefly distinguished by this circumstance. These plants, in common language, are called the *Cress* tribe, and they embrace the *Cabbage*, *Mustard*, *Gilliflower*, and many others. The fruit is either a short pod (*silicle*), as at fig. 10, or a long pod (*siliqua*), fig. 11.

401. **THE CARYOPHYLLACEOUS COROLLA** distinguishes the *Pink* tribe. In this there are five petals with a spreading lamina, and a very long slender claw, as in the *Carnation*, fig. 12, and the *Sweet William*, fig. 18.

402. **THE ROSACEOUS FORM** has five petals, with a very short claw, and a rounded spreading border, as in the *Rose*, *Apple*, and *Strawberry*, fig. 13. Some of the fruits belonging to this type are seen at figs. 19, 20, and 21.

403. **THE PAPILIONACEOUS FORM** (*butterfly-shaped*) has five unequal and dissimilar petals. It distinguishes plants of the *Pea* tribe, and is seen at fig. 14. The upper and most expanded petal is called the **BANNER**, as at *st*, fig. 14; the side petals are termed **WINGS**; and the lower petal, *car*, is termed the **KEEL**, from the resemblance to that part of a ship. The line of separation between the keel and wings is not well defined in the figure; but the form is a familiar one, and can best be studied from Nature. The fruit of a papilionaceous corolla is either a *Legume*, fig. 22, or a *Loment*, fig. 15.

404. **THE LILIACEOUS COROLLA** consists of six divisions expanding into something like a bell form, as in the *Lily*, fig. 16. It is now usually termed a *Perianth*.

405. When the divisions of a corolla all correspond, it is called **REGULAR**, as in the *Wall-flower*, *Carnation*, and *Strawberry*, figs. 8, 12, and 13. When they do *not* all correspond, but vary in size or shape, it is **IRREGULAR**, as in figs. 1, 4, and 5, Plate XXIV.; and when it wants any part which analogy leads us to expect, it is **DEFECTIVE**, as in the *Amorpha*, which is apparently a papilionaceous flower with the banner only, all its other pet appearing torn off, and the *Ritiera*, fig. 11, which has



General subject. Name each figure. Which of these are Regular forms? Which Irregular? How are the Heads at fig. 2—how are they at fig. 3? How at figs. 6 and 7? How are the florets in the Discoid form of the head—in the Radiate form—in the Radiant form? In which are the florets all alike? Which has a regular border? By what are the distinct florets invested in figs. 2 and 6? What kind of Corolla at fig. 5? Why not Personate?

single rosaceous petal. The symmetry of both these flowers is destroyed by Suppression.

406. THE NECTARY.—There are several irregular forms of the corolla, to which the old Botanists gave the name of NECTARIES, or organs for secreting honey. These are of many different forms, as the inflated, or hooded petal of the Lady's-Slipper, the spurs of the Columbine, Nasturtion, and Violet, and the transformed stamens in Parnassia and the petals of the Passion-flower. These are all kindred processes, now being considered as peculiar, or abnormal conditions of the petals; and the Nectary, as a distinct organ, is not admitted into the nomenclature of modern science.

407. The heads in the Order Compositæ are marked by three principal distinctions, which are of high importance in determining the genera. The small flowers that make up the heads are called FLORETS. The heads are

(1) DISCOID, when the florets are *all tubular*, as in the Burdock and the Thistle, fig. 2;

(2) RADIANT, when the florets are *all flat*, or *strap-shaped*, usually called LIGULATE, as in the Dandelion, fig. 3; and

(3) RADIATE, when the central, or DISK FLORETS, are TUBULAR, and the border, or ray florets *ligulate*, as in the Marigold, fig. 7, and the Aster, fig. 6, where the tubular and ligulate florets of the disc and ray, are seen at the left and right.

COLORS OF FLOWERS.

408. Pliny long ago called "blossoms the joy of TREES;" and fanciful as the thought is, we feel, even to this day, that there is not less of truth than poetry in the sentiment; for flowers, more than most other things, minister to that love of beauty, which is one of our inmost affections. While the foliage of trees and plants exhibits that hue which is most grateful and soothing to the eye, the richest tints, and the most splendid combinations of color, are reserved for flowers. We repose amid the embowering greenness of woods, or the waving verdure of meadows; but the sight of flowers stimulates the mental affections, and we become excited by a finer and more exquisite sense of beauty.

409. CHANGES OF COLOR.—Transient as they are, the tints of flowers often undergo several changes during their short life. In the small Forget-me-not, the petals are of a delicate rose-color when they expand, but turn to a bright blue as they mature. Red, purple, and blue

flowers sometimes become white; and yellow, under the influence of light, occasionally assumes the same color. But the most remarkable instance of these changes is that familiar one furnished by the Hydrangea, whose flowers are pea-green when they first open, and afterwards appear in several different colors, and different shades of the same color—white, yellow, pink and purple.

410. ODOR OF FLOWERS.—This, as has already been shown (60), is owing to the presence of a volatile oil. The perfume of flowers is excited by moisture, and hence they give out their fragrance most freely in the evening, when the air is laden with dew. This is particularly true of that class which Linnæus poetically denominated "Melancholy Flowers." These are characterized, not only by their delicious fragrance, but by their brownish, greenish, and yellowish hues, such as the Wallflower and the Evening Primrose. White flowers are generally fragrant, and there is found to be considerable analogy between the *color* and *odor* of flowers generally; those of certain colors agreeing remarkably in the peculiar character of their perfume.

411. DURATION OF THE FLORAL ENVELOPES.—This quality is subject to great variations. The sepals, or petals, are—

(1) CADUCOUS, when they fall soon after the expansion of the flower, as in the Rock-Rose; or when they drop before the flower is completely open, as in the calyx of the Poppy, and the corolla of the Grape;

(2) DECIDUOUS, when they fall before the perfection of the fruit, as is the most common case; and

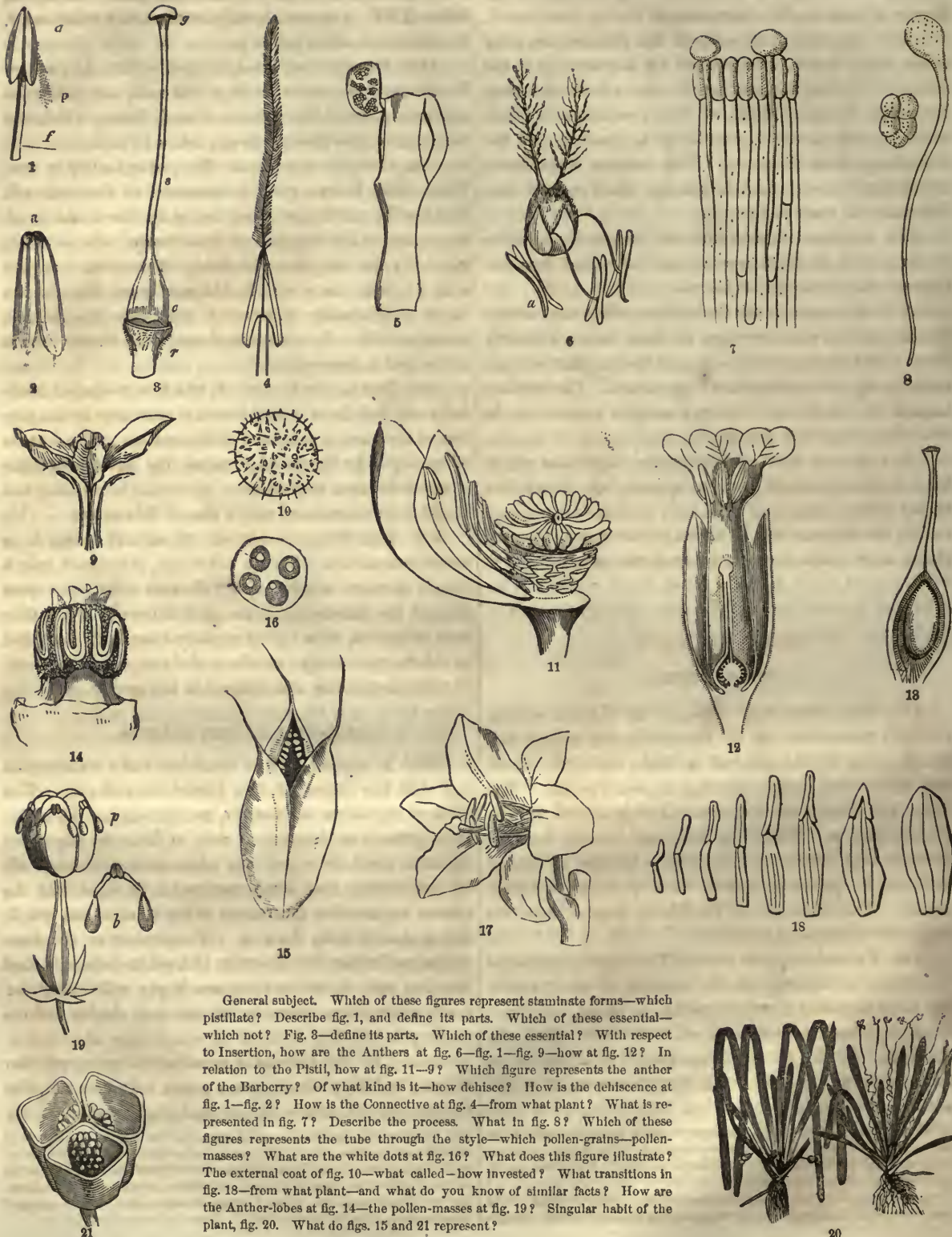
(3) PERSISTENT, when they remain after the fruit is matured, as in the Calyx of the Apple and Strawberry.

412. FUNCTIONS OF THE FLORAL ENVELOPES.—The office of the Calyx and Corolla, as sheltering and protecting organs, must be obvious even to the most superficial observer, since they not only often close spontaneously in bad weather, but many species habitually enfold the tender organs they surround, not only at night, but to afford shelter from the sun. The flowers of the Dandelion, and others of the order Compositæ, close in bad weather, and expand in clear sunshine; while those of many other tribes have regular hours of closing and unfolding.

413. That the Corolla is acted on in a very peculiar manner by light, is no longer a secret. It does not, like the green parts, evolve oxygen, but abstracts it from the air, giving off carbonic acid gas in its place. By this

What are Nectaries—what now considered? Distinction of heads in the Compositæ. Name of their small flowers. Define each form. How are the florets when the head is DISCOID—Radiate—Radiant? Words of Pliny. Why true now? How does the sight of green foliage affect us—flowers? Changes

of color—describe. Remarkable instance. Flowers most fragrant at evening—why? Of what class especially true? Instances. Duration of Floral Envelopes—distinctions—define. Most obvious Function of Floral Envelopes? Give the facts. How affected by light? What chemical influence?



General subject. Which of these figures represent staminate forms—which pistillate? Describe fig. 1, and define its parts. Which of these essential—which not? Fig. 3—define its parts. Which of these essential? With respect to Insertion, how are the Anthers at fig. 6—fig. 1—fig. 9—how at fig. 12? In relation to the Pistil, how at fig. 11—9? Which figure represents the anther of the Barberry? Of what kind is it—how dehisce? How is the dehiscence at fig. 1—fig. 2? How is the Connective at fig. 4—from what plant? What is represented in fig. 7? Describe the process. What in fig. 8? Which of these figures represents the tube through the style—which pollen-grains—pollen-masses? What are the white dots at fig. 16? What does this figure illustrate? The external coat of fig. 10—what called—how invested? What transitions in fig. 13—from what plant—and what do you know of similar facts? How are the Anther-lobes at fig. 14—the pollen-masses at fig. 19? Singular habit of the plant, fig. 20. What do figs. 15 and 21 represent?

process, which appears necessary in flowering, a high degree of heat is often accumulated during that period. The most remarkable instances of this phenomenon occur where many flowers are inclosed by a spathe, as in the Palms. An English species of *Arum* affords the most wonderful instance known of this production of heat, which is sometimes so great as to be sensible, and the flower appears as if burning. The common Wake-Robin of our damp woods, which is a nearly allied species, has, it is said, the same habit.

414. LINNÆUS thought that the corolla might serve as wings, to waft the flower up and down, and thus promote the functions of the stamens and pistils; and others have supposed that its brilliant colors may attract insects for the same purpose, as their honey evidently does. But there must be a deeper design than yet appears in any of these superficial hypotheses. The brilliant hues of the corolla, acted on in a peculiar manner by the solar rays, doubtless promote the absorption of oxygen, and thus assist in decomposing certain substances which have been accumulated in the system, but are at this period rapidly consumed, while their products are retained for the development and nutrition of the ovules, or young plants, after they are separated from the parent.

CHAPTER XXVI.

THE STAMENS.

415. THE ESSENTIAL ORGANS OF REPRODUCTION, you will remember, are of two sorts, and occupy two whorls or circles, the external set being called STAMENS, and the central, or seed-bearing organs, PISTILS. The Calyx and Corolla are not essential organs, because frequently one, and sometimes both, are absent; but the Stamens and Pistils are ESSENTIAL, because no proper seed can be produced without their presence and joint action. The Stamens, or Fertilizing Organs, form the subject of the present chapter.

416. PARTS OF THE STAMEN.—This organ, considered aside from its contents, usually consists of two parts—the long thread-like process, which is called the FILAMENT, and the rounded knob at its summit, called the ANTHÉR. In the Anthér is contained the POLLEN, or fertilizing granules. The filament is often wanting, and

hence the anther is the only essential part. In fig. 1, Plate XXV., a stamen is delineated, with its filament *f*, its anther *a*, and its pollen *p*.

417. ELEMENTARY COMPOSITION—THE ANTHÉR.—In this part, the tender walls of the cells are thickened and strengthened by delicate fibrous bands, which are very elastic, and sensible to the action of moisture; and they lengthen or contract, as the anther is dry or wet. These bands become greatly attenuated as they approach that line by which the anther opens for the discharge of its pollen, called the Line of Dehiscence; and on reaching that point, they are completely interrupted. As the anther approaches maturity, the membrane between the bands is gradually obliterated, and only the delicate fibres are left. In these fine threads, the fibrous system of the leaf is represented.

418. But in the FILAMENT, which is composed internally of a bundle of spiral ducts, is seen the initial process of the more determined *woody system*. This bundle is enveloped by the cellular tissue, the outermost layer of which forms a very delicate epidermal membrane, and is still more attenuated at the line of dehiscence.

419. THE POLLEN consists of cellular tissue in a peculiar condition. To the naked eye, it appears only a simple powder, usually of a yellowish color; yet seen through the microscope, it is found to consist of a multitude of grains, of a highly organized and very beautiful structure, with many variations of form and color, each of which is peculiar and uniform in the species.

STRUCTURE OF THE STAMENS.

420. A stamen may be considered as a transformed leaf, with the edges rolled in toward the mid-vein. The filament represents the petiole, and the anther the blade. It is difficult to conceive of this, at least by one view; but after you have traced the common leaf through all its gradations, from the green sepal to what may be termed its ultimate formations in the stamen and pistil, and thence directly back to the reproduction of green sepals and leaves, it will not be so hard to believe. And this you may do at your leisure, if you will study the gradual transformations in almost any double flower, where you will find stamens in every stage of progress. The Rose, in the cultivated or unnatural state, and the White Pond-Lily, whose many petals form an analogous structure in the natural condition, are good subjects for

Effect on temperature—in what flowers most observable? Remarkable instance. Linnæus' idea. What did others suppose? What highly probable? What absorbed—under what influence—with what effect? What becomes of the hoarded substances—their products.

General subject. What place in the flower do they occupy? What whorls occupied by the Essential Organs? Parts of the Stamen. Define. Which

essential—not essential—why? Elementary composition of the Anthér—Filament—Pollen. What is the Line of Dehiscence? How does Pollen appear to the naked eye—how under the microscope? What may a Stamen be considered? What part does the filament represent—the anther? How proved? Describe the process.



General subject. Define each term. Which figures represent the Normal Placentation? What is this called? How at 2—at 4? Why so called? How at fig. 3? What other figure represents the same mode? Define the parts in fig. 5. How many cells at fig. 1—figs. 2, 3, and 4? How is the Dehiscence at figs. 11 and 14—how at 10 and 13—how at 17—9—22? In which figure does dehiscence occur through *both sutures*—in which through the *ventral suture*—in which through the *dorsal suture*, directly into the cell—in which by a *rupture*—in which by *irritability*—in which by *pores*? In which figures are the ovules inserted on the walls—in which on the central axis? Explain fig. 15. Examples of Indehiscent fruits.

this study. Having done this, you are only to find your way back through the petaloid sepals, or sepal-like petals, to the green leaf again. A series of these transitions from the Pond-Lily, is shown at figs. 11 and 18.

421. THE FILAMENT has a great variety of forms. It is usually a slender, thread-like body, generally somewhat flattened, occasionally marked by other peculiarities, and not unfrequently wanting. It is greatly thickened in the Barberry and Melon, figs. 5 and 14; and is often petaloid in the Pond-Lily, figs. 11 and 18. In regard to color, it is usually white, but sometimes blue, yellow, or red. The filament is not an essential organ; and when absent, the anther is said to be *sessile*.

422. THE ANTHER has its normal position on the summit of the filament. It generally consists of two lobes or cells, which are united by a continuation of the filament, called the CONNECTILE; and the line of this connection is marked by a groove, more or less strongly defined, between the lobes. Each lobe is also marked by a furrow, running through its sides or face from top to bottom. This is called the Suture, or LINE OF DEHISCENCE; and though the line itself is not well defined in fig. 1, its situation may be seen by the direction of the pollen.

423. THE MODE OF ATTACHMENT of the anther to its filament has given rise to three distinctions, which are of considerable importance in analytical observations. The anther is

(1) INNATE, when the connectile rests firmly on the summit of the filament, with no distinction of back or front, as in fig. 1;

(2) ADNATE, when the filament is connected with the anther lobes by their whole length on one side, usually called the *back*, as in the Iris, fig. 9; and

(3) VERSATILE, when it is fixed to the filament by a mere point, on which it lightly swings, as in the Lily and Grasses, figs. 17 and 6.

424. The line of dehiscence is always lateral in the innate anther, as in fig. 1; but in the adnate form, it is opposed to the line of adhesion between the lobes and their connectile, and hence it must occupy what is termed the *face*. When the face of an adnate anther looks toward the pistil, it is called *INTRORSE* (*turned inward*). When it looks away from the pistil, or toward the petals, it is *EXTRORSE* (*turned outward*). The first of these forms is seen in the Pond Lily, figs. 11 and 18; the second in the Iris, fig. 9.

425. The dehiscence of the anther presents many irregularities. In the Barberry, fig. 5, which is a peculiar form of the adnate variety, the anther opens by two valves, that swing up as if by a hinge, like a trap-door. In the Laurel family there are four such valves. The anther of the *Alchemilla* opens transversely; and in the Potato and Heath tribes, the dehiscence is by pores at the summit, as in a species of *Nightshade*, fig. 2.

426. The Connectile exhibits several peculiarities. It is sometimes developed into a kind of beak, as in *Asarum*; in the *Oleander*, fig. 4, it is prolonged in a plumose appendage; it is forked in the *Linden*, so as completely to separate the anther lobes; in the *Violet*, it is prolonged backward into a kind of spur; in the *Sage*, it sits on the apex of the filament, like an inverted bow, with its extremities pointing upward, and tipped by the widely separated anthers; and in many cases it is almost or wholly wanting, so that the anther lobes are united on the summit of the filament. The connectile may be considered the mid-vein of the transformed leaf. In the *Melon*, fig. 14, the anther lobes are waved or sinuous. Versatile anthers are also termed *introrse*, when their line of dehiscence looks toward the pistil, as is the most common case, and *extrorse* in the reverse position.

— 427. The Pollen grains are usually spherical or elliptical, but sometimes they are square, triangular, flattened, cylindrical, or shaped like an hour-glass. But the most curious of all forms is that of the *Zostera*, a sea-plant, common along our coasts, in which they seem to be spun out into long, smooth, shining threads, not unlike a skein of bright glossy silk.

428. Each pollen grain has two coverings, the outermost of which is called the *EXTINE*, and the innermost the *INTINE*.

429. THE *EXTINE* is a firm membrane, generally smooth, but frequently covered with bristles and rough points, as in fig. 10, and sometimes with banded reticulations.

430. THE *INTINE* is thin, delicate, and incapable of extension. If a grain of pollen be immersed in water the extine bursts, while the intine is protruded at one or more points, for a purpose which will be explained in treating of the functions of this and its kindred organ.

431. In the interior cavity of every pollen grain there is a collection of very minute granules, which are found

Good subjects for illustration. Forms of the Filament—when not present? Normal position of the Anther—of what generally consist? By what are the lobes united—what called—how marked? How are the lobes marked? In the mode of Attachment how many varieties? Describe each, with examples. Line of Dehiscence—how in the Innate anther—in the Adnate—when it looks

toward the Pistil? Away from the Pistil? Define Extrorse—Introrse. Irregularities of Dehiscence—how in the Barberry—*Alchemilla*—Potato and Heath tribes? How is the Connectile in the *Asarum*—the *Oleander*—the *Sage*? Common forms of Pollen grains. Other forms. *Zostera*. Contents of the Pollen—the outer—the inner. Describe each. What in the interior cavity?

to be composed of starch and oil. Collectively they are named the FOVILLA; and in them have been discovered rotatory motions of great rapidity, which by some authors are considered similar to those observed in the sporangia of cryptogamic plants.

432. A parent cell, from a pollen grain of the Melon, is seen at fig. 16. It contains four secondary or daughter-cells, each with a nucleus in the centre, showing that the pollen grains follow the common law of cell multiplication (34, at (1)). The parent cell first divides in two, and then each of the parts subdivides in the same manner, thus forming four cells.

433. Sometimes the pollen grains cohere in clusters, as in the Milk-weed, fig. 19, where the pollen masses are seen arranged in pairs, and adhering to the glandular processes of the pistil. At *b* is a pair of the masses separated. It is better to examine the flower itself, which is not only very curious, but common and easily procured. No good student will be satisfied with a picture, who can find and analyze the natural form itself.

434. The stamens collectively have received the name of ANDRŒCIUM; and as it is sometimes necessary to speak of the staminal System as a whole, the term is a convenient one.

435. The number of stamens in a flower is designated by prefixing Greek numerals to the word ANDRIA, which signifies *stamen*, as in the artificial classes of Linnæus. Thus a flower is

- Monandrous, with *one* stamen;
- Diandrous, *two* stamens;
- Triandrous, *three* stamens;
- Tetrandrous, *four* stamens;
- Pentandrous, *five* stamens;
- Hexandrous, *six* stamens;
- Heptandrous, *seven* stamens;
- Octandrous, *eight* stamens;
- Enneandrous, *nine* stamens;
- Decandrous, *ten* stamens;
- Dodecandrous, *twelve* stamens; and
- Polyandrous, *more than twelve*, or *many* stamens.

436. In regard to comparative size, they are

(1) Didinamous, four stamens, two longer than the others; and

(2) Tetradinamous, six stamens, four longer than the others.

437. Some other peculiarities have also been made the basis of names. The stamens are

- Monadelphous, united by their filaments in *one* set;
- Diadelphous, united by their filaments in *two* sets;
- Triadelphous, united by their filaments in *three* sets;
- Pentadelphous, united by their filaments in *five* sets;
- Polyadelphous, united by their filaments in *more than five* sets;

Syngenesious, united by their anthers;

Monœcious, stamens and pistils, in separate flowers of the *same* plant;

Diœcious, stamens and pistils, in separate flowers of *different* plants;

Polygamous, staminate, pistillate, and perfect flowers intermingled.

438. The Functions of the Stamens will be considered in connection with the Pistil, from which they cannot well be separated.

CHAPTER XXVII.

THE PISTIL.

439. THE PISTIL is the interior seed-bearing organ, occupying the centre of the flower. It consists of three parts—the Ovary, the Style, and the Stigma.

440. THE OVARY is the expanded and hollow base of the pistil. It contains the OVULES, or rudiments of the seed, and finally becomes the FRUIT.

441. THE STYLE is the erect column, usually produced from the apex of the ovary, and which, when simple, or consisting of several combined in one, evidently continues and terminates the Axis of Growth.

442. THE STIGMA is a more or less rounded body, usually standing on the summit of the Style. The Ovary that bears the seed, and the Stigma which assists in its elaboration, are both essential parts, and are never absent; but the Style is often wanting, and is, therefore, not essential. When the Style is absent, the Stigma is said to be *sessile*. At fig. 3 a Pistil may be seen, with its ovary, *o*, seated on the receptacle of the flower, *r*; *s* is the style, and *g* the stigma.

443. ELEMENTARY COMPOSITION.—The ovary and style are composed of one or more bundles of ducts, enveloped in parenchyma. The stigma consists of a loose cellular substance called the CONDUCTING TISSUE, and communicates with the ovary by a tube through the centre of the style, as you may see in figs. 12 and 13. The stigma, you will remember (77), is the only part of

anthers. When are flowers Monœcious—Diœcious—Polygamous?

General subject. Define Pistil—where situated—its parts. Define each. Which essential—not essential? When the Style is not present how is the Stigma? Elementary Composition. What part destitute of epidermis?

Of what composed? Motions observed. Describe the four Pollen grains—what show? How is the Pollen in the Milk-weed? Name of the stamens collectively. Define a flower by its number of stamens, from one to many. How when the stamens are united by their Filaments—describe varieties—by their

the plant directly exposed to the air, which is destitute of the epidermis. The importance of the Ovary is such, that it will be treated of in a chapter by itself. At fig. 15 is the pistil of the Meadow Saffron. The ovary is nearly mature. It bears a short, pointed, permanent style on each of its three divisions, and the ovules on its inner walls. At fig. 21 is a transverse section of the ovary in the same plant, before its parts separate, showing how the ovules are at first deposited.

444. The Pistillate system collectively is called the GYNÆCIUM.

445. The degrees of coherence or separation in the styles may be indicated by describing them as *distinct*, united at the *summit*, united to the *middle*, or at the *base*, as the case may be.

FUNCTIONS OF THE STAMENS AND PISTILS.

446. The joint action of the stamens and pistils must now be explained, for this is one of the most important processes in nature. Its specific object is the *fertilizing of the ovules*, and the PRODUCTION OF SEED.

447. When the stamens and pistils have reached maturity, the anthers, being acted on by moisture and other causes, discharge their pollen. Under ordinary circumstances, a part of this, almost as a matter of course, falls on the stigma, which at the same time is covered with a viscid moisture. The pollen grains being soon affected by the moisture, expand. The extine bursts, while the intine is protruded in the form of a tube. The tube insinuates itself between the cells of the stigma, passes down into the style, and finally reaches the ovary. Thence it is extended toward the ovules, and enters the orifice that leads into their NUCLEUS, which, at this time, is always turned toward the base of the style, and in direct communication with its conducting tissue. At fig. 7, two of these pollen tubes from the Snapdragon, are represented as passing through the tube of the stigma. At fig. 8 is a separate tube from the Purple Orchis, and a pollen mass of the same. All that is certainly known of this very curious process is, that the embryo first appears in the ovule soon after the entrance of the pollen tube.

448. THE AUTHOR OF LIFE has made many provisions to promote and secure this result. In the first place, the stamens and pistils are generally associated, by being brought together in the same flower. This may be assumed as the true or normal position, and all others

as the effect of suppression. When the flower is erect, the pistil is the longest, as in the Tulip; but when the flower is drooping, as in the Lily, fig. 17, the stamens are longest; so that, in both cases, the pollen would necessarily fall in the direction of the stigma. In the Barberry and Mountain Laurel, the filaments are very elastic, and when touched by any small body, as the feet of insects, they spring forward with great force, and dash their pollen against the stigma.

449. Monœcious and Dioœcious flowering trees generally put forth their blossoms at windy seasons of the year, when there are no leaves to obstruct the course of the pollen, which in those tribes is very abundant. It spreads over the trees in all directions, and thus passes to the flowers without interruption. This work is also greatly assisted by insects, which, in abstracting honey from the flowers, scatter their pollen, and carry it from flower to flower; thus conveying to the fruitful but solitary tree or herb, the means of fertilization.

450. There are also many curious contrivances to promote this object. In the Saxifrage and Parnassia, the stamens, one or two at a time, lean over the stigma, shed their pollen, and retire, to make room for others. The five filaments of the Coxcomb are connected at base by a membranous web, which expands with moisture; but contracting in dry weather, it brings the stamens together, and scatters the pollen on the stigma.

451. But there is nothing of this kind more curious than the habit of the Vallisneria, which is found growing at the bottom of ditches in Italy, and is represented at fig. 20. The fertile flowers grow on long, spiral stalks, which, when the stigma is mature, uncoil themselves, and thus elevate the flowers above the surface. At the same time, the barren flowers, which grow on short, straight stalks at the bottom, become detached, rise to the surface, and float around among the pistillate flowers, often covering the water, as if with sprinklings of white foam. Soon after this happens, the pistillate flower-stalks resume their spiral form, and sink to the bottom, where they ripen their seed.

452. In the Fig, where the flowers are not only dioœcious, but are borne on the *inside* of the hollow receptacle which becomes the fruit, the fertilization could only be accomplished by means of insects passing from the barren to the fertile flowers.

453. But the habit of the Aristolochia is even more peculiar, for it has a particular insect which seems devoted

Name of the Pistillate system. How may coherence of the styles be described? Specific use of Stamens and Pistils. Describe the process of fertilization. What the only fact known of it? Normal position of Stamens and Pistils—when the flower is erect, how are they—how when it is drooping—what

effect? How are the filaments in the Mountain-Laurel—the Barberry? How are Monœcious and Dioœcious trees fertilized? Of what use are insects? What curious contrivances? How in the Saxifrage and Parnassia—the Coxcomb? Describe fertilization of Vallisneria—Aristolochia. How is the Fig fertilized?

to this special purpose. This is a species of *Tipula*. It enters the flower, and descends to the base, where the stamens and pistils seem like complete fixtures, the anthers being placed quite under the stigma; so that, in the ordinary course of things, there could be no communication between them. But the fly, in attempting to return, is beset by inverted hairs, which thickly cover the inside of the tube. Thus imprisoned, he continually struggles to escape, and by this means, apparently so simple and natural, he effectually breaks the ice between the parties most interested. Fertilization ensues, the flower withers, and the fly regains its liberty. It is not the least curious part of this history, that an American species, cultivated in England, was seldom fertilized, probably for want of the good little Genius it would have found in its native habitat.

CHAPTER XXVIII.

THE OVARY.

454. This organ is either simple or compound: simple, when composed throughout of but one piece or part; and compound, when consisting of more than one. A compound ovary is a whorl of transformed leaves, with their cohering edges united in the axis, and their confluent sides radiating from the centre, as may be seen in the transverse section of fruit from the Lily, fig. 8, Plate XXVI.

455. PARTS OF THE OVARY.—The divisions of a compound ovary are called CARPELS. The walls or partitions of these are DISSEPIMENTS, and the spaces between them are CELLS. In fig. 7 is seen a transverse section of the compound ovary of Meadow Saffron. The dissepiments, with their double walls, and the ovules attached to their inner portions, are well delineated.

456. In the normal structure, the number of carpels, dissepiments, and cells, will be equal; but sometimes the dissepiments become partially or wholly absorbed in the growth, or obliterated by abortion; while the carpels, or actual parts of which the ovary is composed, remain unchanged. In the diagram, fig. 1, is represented a five-carpelled ovary, with its ovules, *o*, attached to the floral axis in the centre. This is better seen in the fruit of the Lily, fig. 8, which is a three-carpelled ovary, with the seeds attached in the same manner. In the diagram,

fig. 2, the dissepiments are only extended a little way beyond the middle; in fig. 3 they are wholly obliterated, the ovules still being attached to the central axis; in fig. 4, the dissepiments are the same, while the ovules are attached to their first rudiments on the outside wall of the ovary. Sometimes, but rarely, the styles—and more rarely still, the stigmas—of a compound ovary, unite, and form apparently one.

457. It should be understood that each carpel is composed of a single leaf, folded with its confluent edges turned inward toward the floral axis. This may be often seen in the Double-flowering Cherry, where the carpellary leaves, which by culture are retransformed into petals, are obvious in their folded form, being often tipped with the rudiments of the stigma, and presenting other indications which mark their character, especially when they assume the texture, color, and indentations of the proper leaf, as if making an effort to return to their normal shape, though growing in the midst of a flower. Two such leaves are seen in fig. 15.

458. SUTURES.—The line formed by the cohering edges of the infolded carpellary leaf is called the VENTRAL SUTURE. It is always turned toward the floral axis, or centre of the flower, and is a true suture, or *seam*, as its name imports. The line opposite, in the external walls of the ovary, is called the DORSAL SUTURE. It is sometimes marked by a prominent line or ridge, and is the mid-vein of the transformed leaf. In the fruit of the Iris, fig. 14, the prominent line seen in front of the middle section is the ventral suture; while the dorsal suture bounds the side carpels, right and left.

459. THE PLACENTA is that part of the ovary to which the ovules are attached; and, in its normal state, is a cellular outgrowth of the ventral suture. It often appears a distinct cord, as in the Bean, where, in common language, it is that part which is called the "*string*," and is pulled off, in preparing for the table the green pods known as "*string-beans*." The pod, you will remember, is an ovary; the young beans are the ovules; the cords to which they are attached, are the placentæ; and the parts into which it spontaneously separates, are *valves*. The double character of the folded leaf which makes the carpel, is well shown in this structure, and also in that of the Pea, fig. 18, where the ovules are seen occupying alternate positions of the Placentæ, which mark the ventral suture, and also the two plates, or valves, into which the pod separates.

General subject. When is the Ovary *simple*—when *compound*? Name the divisions of a Compound Ovary—the walls, or partitions—the spaces between. How in the normal structure? What effect has abortion? Several degrees of abortion in the dissepiments. Describe each. Do styles and stigmas of a compound ovary often unite in one? Of what is each Carpel composed—

in what flower seen? Describe. What are *Sutures*—the Ventral—the Dorsal? Where is the first always turned—at what part of the leaf? What marks the second? Define Placentæ—how in the Bean? Define the parts in the fruit of the Pea.

460. **PLACENTATION** is the manner in which the ovules are arranged in the ovary. In the diagram, fig. 1, is seen the normal or typical placentation, with the dissepiments reaching quite to the centre, and bearing the placentæ on their extremities, which are the two confluent edges of the infolded leaf, and the ovules looking directly to the floral axis. This form is called **AXILLARY PLACENTATION**.

461. But sometimes the whorl of carpellary leaves apparently cohere only by their edges, without any infolding, or the walls may have become obliterated entirely or partially, in the distention of growth. In fig. 2, the dissepiments are partially obliterated; the ovaries are seen occupying their place at the termination of the walls; while the ovary becomes one-celled by the abortion or malformation. At fig. 4, the dissepiments are completely obliterated, while the ovules appear attached to their rudiments in the outer wall of the ovary. These two last forms of placentation are called **PARIETAL** (*on the walls*).

462. By a complete reverse of the last position, the ovules are thrown quite to the centre, while, at the same time, the dissepiments being absent, they are left free. This is called a **FREE CENTRAL PLACENTATION**, as in fig. 3. Thus there are three modes of deposition in the ovules—Axillary, Parietal, and Free Central Placentation. The Primrose, fig. 6, is a fine instance of the latter mode. The round placenta, with its numerous ovules, is attached only by a point at its base, and nearly fills the ovary. Here only the dissepiments are wanting to complete the normal structure, and it may be supposed they are obliterated by the growth of the ovary. This is certainly true in some cases; for in the Pink and Chickweed tribes, which are distinguished by a free central placentation, rudiments of the walls may be seen at an early stage of growth. Occasionally other forms of placentation are met with, but the variations are unimportant.

463. When the ovary consists of a single carpel, as a matter of course, there can be no true dissepiments; but false dissepiments are occasionally to be met with, as in the Flax. In determining the character of an ovary, a careful distinction should be made between the really simple organ, or that which is composed of a single car-

pellary leaf, and the compound ovary, which is a coalescent circle of leaves. When the dissepiments are absent, the number of carpels may be determined by the number of placentæ, if these are parietal, or by the number of styles or stigmas, or by the grooves or sutures in the ovary itself. In all parietal placentation, the ovary must be one-celled.

464. A fine illustration of the double nature of the walls formed by the contiguous sides of the carpellary whorl, is seen in the fruit of the Meadow Saffron, fig. 7, where each of the three carpels is completely isolated, and incloses its own ovules.

CHAPTER XXIX.

THE FRUIT.

465. This term signifies much more in botanical than in common language, it being applied to *the mature ovary, and whatever organs it is coalescent with*, as the calyx in the Apple, and the receptacle in the Strawberry. By this definition, the dry pod of the Cabbage is as truly a fruit as the pulpy and delicious Peach.

466. **THE FRUIT** consists of two parts—the **SEED**, and its **ENVELOPE**. The latter, taking its name from its office, is called the **PERICARP** (*around the fruit*). With the changes that occur in the growth and ripening of fruit, the pericarp develops into two or more distinct and different portions, the exterior becoming firm or bony, and the interior pulpy or fleshy, as in the Orange and Cocoa-nut; or the reverse occurs, and the outside is pulpy, and the inside hard and bony, as in the Peach. When the parts are thus distinct and separate, the outer portion is called the **EPICARP**, and the inner portion the **ENDOCARP**. But in such fruits as the Peach, the pulpy portion is called the **SARCOCARP**; and the hard shell, which corresponds with the endocarp, the **PUTAMEN**. In the Cherry, fig. 5, the outside integument, or skin, is the Epicarp, *e*; the pulp, *s*, is the Sarcocarp; the bony shell of the nut, *en*, is the stone, putamen, or Endocarp; and *g* is the seed. But often the pericarp remains of the same texture throughout. In the acorn it is indurated; in pods membranaceous; in berries, fleshy; and in all such cases no distinctions of parts are observed, but only those of the outer and inner integuments.

Define Placentation—its normal form. How when the dissepiments are partially, or wholly obliterated, and the ovaries on the walls—how with ovaries free in the centre? Define Parietal. How many modes of position in the Ovules? Define each. What distinction necessary? Of what is a Simple ovary composed—a Compound ovary—how distinguished when the dissepiments are missing? What shown in Meadow Saffron?

General subject. To what is the name applied botanically? By this defi-

nition what are fruits? Parts of the Fruit? Name of the Envelope? Define. Changes in the Pericarp—its parts. Define. Name of the pulpy portion in the Peach—the hard shell—with what part correspond? Describe the parts in the Cherry. Are these parts always to be distinguished? How is the pericarp in pods—in berries? What is the opening of fruits called—when fruits do *not* open what called?



General subject. What figures represent Capsules — which Achenia? What kind of fruit at fig. 16? Define its parts. How is it shown to be fruit? What kind of fruit at figs. 1 and 6—how many carpels? Parts of the Capsule—define. Explain fig. 5. What kind of fruit at 3, 11, 14, 17, and 18? Define each, and give examples. Difference between 11 and 16—which figures are of

Drupes? Define the parts in fig. 21. What kind of fruit at figs. 9, 10, 3, 4? Fig. 23. Fruit of one of the Borragae tribe dividing into 4 Achenia, with the style in the centre, showing that it is a true fruit, and not four naked seeds, as named by Linnæus. Fig. 24. Fruit of an Umbelliferous plant, dividing into 2 achenia, and suspended from the axis or CARPOPHORE.

467. **DEHISCENCE.**—Some fruits always remain closed, as the Acorn, Cocoa-nut, and Apple. Such are said to be **INDEHISCENT**, or *not opening*. The Dehiscence of fruits is quite an important feature of discrimination in all true analysis, and therefore should be defined. It is

(1) **SEPTICIDAL**, when the fruit opens by the ventral suture, and the carpels separate between their contiguous walls, as in the Gentian, fig. 22.

(2) **LOCULICIDAL**, when it opens by the dorsal suture directly into the cell, as in the Iris, fig. 14, the Lily, fig. 8, and the Meadow Saffron, fig. 11 ;

(3) **SEPTIFRAGAL**, when the valves break off from the dissepiments, as in the Morning-Glory and the Thorn-Apple, fig. 10 ;

(4) **SUTURAL**, when a single carpelled fruit opens by the ventral suture, as in the Peony ; by the dorsal suture, as in the Magnolia ; or by both the ventral and dorsal sutures, as in the Bean and the Pea, fig. 18 ; and

(5) **TRANSVERSE**, when it describes a line directly across the sutures, and the upper part opens and falls back like a lid, as in the Plantain, Purslane, Henbane, and the Scarlet Pimpernel, fig. 9. This form is of rare occurrence. The Loment, fig. 23, separates in a transverse direction between every two seeds.

468. To these may be added several varieties. In the familiar instance of the Poppy, the fruit opens by pores at the summit, as in fig. 13. In the Balsamine, fig. 12, the pods, when ripe, are very irritable ; and on being touched or jarred, the valves fly open elastically, and scatter the seeds ; and hence its common name, Touch-me-not. In some of the Tobacco and Primrose families, the pericarp opens only for a short distance ; and in the fruit of the Castor-oil plant, the dehiscence is first loculicidal, and then the carpels separate from each other in a septicidal manner. In Mustard, and others of the Cruciferae, the parietal placentae are united by a membranous partition, from which the valves separate in dehiscence, from the base upward, as in figs. 16 and 19. The Strawberry, Currant, and Peach, figs. 17, 20, and 21, are indehiscent fruits.

FRUIT FORMS.

469. The forms of the pericarp are exceedingly varied ; but the most important and strongly marked are the following : the Capsule, the Silique, the Silicle, the Legume, the Follicle, the Berry, the Pepo, the Pome, the Drupe, the Nut, the Caryopsis, the Achenium, the Sa-

mara, the Pyxis, and the Cone. All fruits are either simple or collective.

SIMPLE FRUITS.

470. These may be composed either of a single carpel, or of several united ; and they are not always developed from the pistil alone, but they also often combine with this, other parts of the flower.

471. A **CAPSULE** is a pericarp of a dry and woody texture. It is always compound in structure, because it is produced from a compound ovary, although in growth it frequently becomes one-celled, as we have seen (461), by the absorption or rupture of its walls. The fruits of the Iris, Scarlet Pimpernel, Lily, and Thorn-apple, figs. 2, 7, 13 and 22, Plate XXVII., are all Capsules.

472. **PARTS OF THE CAPSULES.**—These are,

(1) **THE VALVES**, or parts into which it separates by dehiscence, as in the Iris, fig. 2 ; and

(2) **THE COLUMELLA**, or central portion, formed by the united placentae, when the placentation is axillary, as in the Lily, fig. 13.

473. **THE SILIQUE** is a long, slender, two-valved pod, which becomes two-celled by a false dissepiment, though produced from a simple ovary, as in fig. 3. The pods of the Mustard and Cabbage are familiar examples. This and the following form distinguish the Cress tribe, and are always marked by the cruciform corolla.

474. **THE SILICLE** differs from the silique only in being broader and shorter, as in fig. 4. The Pepper-grass and Candytuft are well-known examples.

475. **THE LEGUME** is a simple, one-celled pod, dehiscing by both the ventral and dorsal sutures, as in the Pea, fig. 5 : *ep* is the epicarp ; *en* the endocarp ; *pl* the placenta, which is double, and runs along each edge of the ventral suture ; and *f* is the **FUNICULUS**, or little stalk, by which the ovules, *o*, are attached to the placentae. The Legume distinguishes the Pea tribe, and is usually accompanied by the papilionaceous corolla. The Loment, fig. 12, is a variety of legume, which separates transversely into one-seeded joints, as in Bush Clover, and various species of Trefoil. The legume, in Lucerne, is coiled up in a spiral form ; and in a species of Cassia, it is like a little cupboard with partitions or shelves, where the seeds are deposited.

476. **THE FOLLICLE** is a one-carpelled fruit, folded in the form of a pod, and dehiscing by the ventral suture, as in the Peony, Milk-weed, and the Indian Hemp, fig. 17.

477. **THE BERRY** is a pulpy or fleshy indehiscent

Varieties of Dehiscence. Define each, with examples. How in the Tobacco and Primrose families—the Castor-oil plant—Mustard—Balsamine ? Principal Fruit Forms. Define each, with examples. Parts of the Capsule—define.

Difference between the Follicle and Legume—the Legume and Loment—the Silique and Silicle ?

pericarp, with the seeds irregularly immersed in its substance, as the Grape, Gooseberry, and the Currant, fig. 10. The fruits of the Egg-plant, Potato, Orange, and Lemon, are berries, the two latter being distinguished by a thick and spongy rind.

478. THE PEPO is an indehiscent pulpy fruit, closely allied to the berry. It is formed of three united carpels covered by a firm rind, and usually exhibits a fleshy structure between the epicarp and the pulp that invests the seed. The Gourd, Melon, and Pumpkin, are well known illustrations. In many cases, the dissepiments are obliterated in growth, so that the pericarp becomes one-celled, and the placenta parietal; but in the early stages, the three carpels, with all their parts, may be distinctly traced, as they are seen in the Prickly Cucumber, fig. 18. The fruit of the Papaw resembles the pepo.

479. THE POME is an indehiscent fleshy pericarp, formed of two or more horny or bony carpels, which are invested with the swollen and succulent tube of the transformed calyx, as in the Pear, Quince, and the Apple, figs. 1 and 6. The five carpels are well shown in the transverse section, and the structure of each, with its position in the pome, in the vertical section. In the Apple, the outer skin is the epicarp, the fleshy portion the sarcocarp, and the bony carpels which invest the seed, or that part which, in common language, we term the *hull*, is the endocarp.

480. THE DRUPE is an indehiscent, one-celled, and one or two-seeded fruit, with the endocarp hard or stony, investing one or two seeds, and the epicarp pulpy or fleshy, as in the Walnut, Cherry, and Peach, the two last of which are seen in figs. 15 and 21. The epicarp, in all these cases, is greatly expanded, and the fruit takes an increased development by cultivation. The Walnut, which was considered by the old Botanists as a nut, is now ranked among drupaceous fruits. The outside shell, or thickened husk, is a fleshy epicarp, the shell is the endocarp, and the kernel the seed.

481. THE ACHENIUM is a dry, indehiscent, one-seeded pericarp, formed of a single carpel, which is so closely applied to the seed, that it was long mistaken for the seed itself, from which it is often difficult to distinguish it without a close analysis. By cutting across the fruit, the true seed may be seen lying free in the pericarp. Hence Linnæus fell into the error of calling such fruits as were composed of achenia, *naked seeded*; but they

are all furnished with a style, which determines their true origin and nature. They are, in short, mature ovaries, and therefore fruits.

482. The achenia are variously disposed in different fruits. In the Crow-foot tribe, they are collected on a dry, convex receptacle. At fig. 19 is an achenium from one of this family, greatly magnified. In the Fennel tribe, there are always two achenia united by their faces, so as to form a compound fruit, with a division between them, called the *COMMISSURE*, which makes an important feature in the analysis of that large and difficult family. In the Mint tribe, the four achenia, which lie loose in the bottom of the calyx, have a common style, to which each of them is attached by the base. In the Strawberry, the achenia are arranged on a convex receptacle, and when ripe, they are immersed in pulp; while in the Blackberry and Raspberry they form little drupes.

483. What have usually been considered seeds, in the large family of Compositæ, are, in fact, single-seeded fruits invested with the tube of the calyx, the limb of which assumes a variety of shapes, called *pappus*, as you have already learned (386). In the Clematis, the styles are remarkably prolonged and plumose, and they are also conspicuous in some of the Sedges. A vertical section of the fruit from one of this family is shown at fig. 16. The dark-colored albumen, or nucleus of the seed, is seen, with its integument, which is separable from the investing pericarp, and its minute embryo at the base. This structure clearly demonstrates the true nature of the achenium, especially by the addition of the long styles, which show that it has a real pistil, and therefore is a true fruit. At fig. 20 is an achenium of the Fumitory. The Strawberry, Blackberry, and Raspberry, are not, strictly speaking, simple, but aggregate fruits.

484. THE CARYOPSIS is a dry, thin, and membranaceous pericarp, investing the seed so closely, as to be inseparable from it; and in the last respect it differs from the achenium. The grains of Wheat, Rye, Maize, and most Grasses, furnish examples. At fig. 11 you will see a fruit of this kind in the Oat grain. All such fruits have been considered seeds, but by examining them in the early state, and especially by the attachment of the styles, we find that they are really composed of the expanded ovary, and therefore fruits.

485. A NUT is a hard, dry, indehiscent pericarp, usually composed of two or more carpels, with one or more ovules in each, but reduced to one by suppression, as in the Beech and Oak. The Nut is often inclosed by

The Achenium and Caryopsis? Fruit of the Papaw. What have the Achenia been called? Why change the term? Why real fruits—how in the Crow-foot tribe—in the Strawberry—the Mint tribe—the Compositæ—the

Raspberry—the Fennel tribe? Name the division between the compound fruit in the last. What, properly speaking, are the Strawberry and like fruits?

a kind of involucre, as in the burr of the Chestnut, and the cupule of the Oak, fig. 8.

486. THE SAMARA may be termed either a nut or achenium, with a winged margin, as in the Birch. The fruit of the Maple, fig. 14, is a twinned samara.

487. THE PYXIS is a capsule, opening transversely by a kind of lid, as in the Scarlet Pimpernel, fig. 7.

MULTIPLE OR COLLECTIVE FRUITS.

488. These are usually produced from a dense assemblage of flowers, united with their envelopes, and seated on a more or less convex and elongated receptacle, the whole mass of which, generally becoming more or less pulpy and edible, forms the fruit. They are either fleshy, as in the Bread-fruit and Pine-apple; pulpy and juicy, as in the Mulberry; or composed of dry and scaly bracts, covering one or more naked seeds, as in the fruit of Pines.

489. THE FIG is a multiple fruit, composed of numerous flowers inserted on a hollow receptacle, by which they are completely inclosed. What are called the *seeds* are, in fact, achenia, with their persistent style and stigma.

490. The character of the Fig is completely reversed in the Mulberry, which has been compared to a Fig turned inside out.

491. THE CONE (*strobilum*) is composed of dry or horny scales, each of which forms an open carpel, bearing one or more naked seeds, as in the Pines, fig. 4, Plate XXVIII. The fruit of the Hop, fig. 2, is a cone, with dry, membranaceous scales.

492. The Pine-apple, fig. 1, is nearly related to the cone in structure, the chief difference seeming to be that the latter has neglected the development of pulp. The bracts at the summit of the Pine-apple, not being exhausted, like those below, by the production of pulp, become expanded.

493. The adhesion of two flowers sometimes forms a double or twinned fruit, as in the beautiful little Partridge-berry of our woods, and several species of Honey-suckle. The principal difference between Multiple and Aggregate fruits is, that the former are produced from an assemblage of many flowers, the latter from a single flower. At figs. 3 and 6 are fruits of a Moss and a species of Fern.

CHAPTER XXX.

THE SEED.

494. ELEMENTARY COMPOSITION.—The seed consists of cells, and the nutritive substances which are stored up in them, for the nourishment of the young plant.

495. STRUCTURE OF THE SEED.—The seed usually is composed of three parts, the Integuments, the Albumen, and the Embryo. The second of these is sometimes wanting.

496. THE INTEGUMENTS.—The external or proper seed-coat is called the EPISPERM, or more commonly the TESTA, and the inner is the ENDOSPERM, or TEGMEN. In a section from the seed of the Pea, fig. 10, *te* is the episperm, *e* the endosperm, *c* the fleshy cotyledon, and *g* the embryo.

497. THE EPISPERM.—This membrane exhibits a great variety of forms, colors, and degrees of smoothness. It is winged in the seeds of the Trumpet-flower and the Pine tribe, as in fig. 7, which represents a seed of the Fir—bony in the Nutmeg; and in many plants it is furnished with a hairy appendage, which by rendering the seeds buoyant, or attaching them to other bodies, aids in their dispersion. In the Silkweed it is covered with a tuft of hairs called the *coma*; and in the Cotton-plant the whole seed is enveloped by a soft wool, which gives its name and economical value to the plant. A single fibre of cotton is seen at fig. 13, and one of wool at 14, both greatly magnified, and showing the difference of structure. The pappus of the Compositæ should not be confounded with the hair that invests the seed, it being, in fact, the calyx, and an appendage of the pericarp itself.

498. THE ENDOSPERM is the inner integument, but is often so strongly adherent to the episperm as to be indistinguishable from it; and sometimes it is not present. It is seen at *e*, fig. 10, while at *te* is the episperm.

499. THE NUCLEUS, or kernel, is the essential part of the seed, and consists of the Albumen, when that substance is present, and the Embryo. About the time of flowering the nucleus becomes hollow; and after fertilization the embryo is deposited in the cavity. The integuments of the ovule are open at the summit of the nucleus; and through this opening, which is called the FORAMEN, or MYCROPYLE, the fertilizing influence of the pollen is admitted to the nucleus. This point, which is seen at *m* in fig. 10, always indicates the root end of the embryo. The CHALAZA, *ch*, is that point through which the fibrous vessels, *rap*, communicate between the nucleus and the integuments.

Difference between Multiple and Aggregate fruits? Instances of each. How are twinned fruits formed? Instances.

General subject. Elementary Composition. Parts. Which sometimes wanting? Name the Integuments. What is the outer commonly called—the inner? Describe the Episperm. How in the Milk-weed—the Cotton plant?

Distinction between seed-down, and Pappus. Describe Endosperm—is it always present—apparent? Essential part of the seed—of what consist—how about the time of flowering—what after fertilization? Opening at the summit of the Nucleus—its synonym—office—position? Name the stalk of the seed.



General subject. What fruits at figs. 1, 2, and 4? Are they Simple or Multiple? What leaves at the summit of fig. 1? What fruits at figs. 3 and 6? What is shown in figs. 5, 8, and 12? Which the most common form? Explain fig. 10, and define its parts. Explain fig. 9. Point out the Placentæ—the Funiculus—the Hilum. What at fig. 15—what in its cells? What do figs. 16 and 20 represent? Explain the parts—figs. 17 and 19. Explain. What at fig. 11? Describe figs. 13 and 14. Which of these fruit forms have no seed? What kind of seed at fig. 7?

500. THE FUNICULUS is the stalk of the seed. It is seen at *f* in the figure, and is always conspicuous in the Bean and Pea. It is through this part that the ovule receives nourishment from the placenta. The scar formed by the separation of the seed is called the HILUM; and this also is conspicuous in the two tribes of plants just referred to, where it is called the *eye*.

501. THE ALBUMEN consists of the nutritive tissue which has been elaborated, and becomes persistent in the cells of the ovule. It is composed of a floury, starchy, or farinaceous substance, as in Wheat, Maize, and the other cereal grains; it is oily in the Sun-flower and Walnut, mucillaginous in the Mallow, and leathery in the Coffee. By this you will perceive that it is not the simple substance which chemists have named Vegetable Albumen. It contains, in fact, nutritious matter of various kinds, for the support of the young plant, which absorbs, or feeds on it during germination, or until it is able to elaborate food for itself. In the cereal grains it constitutes almost the entire seed; but in the leguminous plants, as the Pea and Bean, it is wholly wanting, its place being supplied by the greatly thickened cotyledons, which are composed of an equally nutritive substance termed legumine (69). The situation of the cotyledon is seen at *cc* in fig. 19, and you will perceive that it is identical with that of the albumen, as illustrated by the Sedge, fig. 18.

502. THE EMBRYO being the ultimate end of all vegetation, it must be the important and essential part, for the production, support, and growth of which, all other parts, principles, and powers of the whole plant have been elaborated and exhausted. It contains, in a rudimental state, all the organs proper to its species, and becomes a plant by the development of parts *already formed*, and *not by a new formation*. The primordial leaves (118), and the initial stem, are often distinct in the embryo; and they are conspicuous in the Garden Bean and Pea-nut, as at fig. 11. In the small figure at the right hand is seen the young plantlet, with its delicately folded leaves. The Embryo is usually a straight, club-shaped body, as at fig. 12; but it is sometimes variously curved, as at figs. 5 and 8.

503. THE ARIL is a partial covering investing some seeds. It is developed either from the funiculus or the placenta, and is fleshy or cartilaginous in texture. It

forms the pulpy envelope of the seed in Mandrake, and in the Roxbury Wax-work it is the scarlet pulp that envelopes the orange-colored seed. The lacerated covering of the Nutmeg is a fine example of the aril. In many seeds this appendage is a mere scale, and in many more it is wholly wanting.

GERMINATION.

504. This term, as you have already learned (122), denotes the first vital action of the seed, by which it is developed into root, stem and leaves, or the organs of a new plant. The circumstances most favorable to germination are, a moderate temperature (in our climate ranging from 50° to 60° of Fahr.), air, moisture, and obscuration or absence of light. But plants will germinate in much higher and lower degrees than those mentioned. In the Polar regions, certain plants will put forth their hardy germs under arches of ice, which not only shelter them, but admit the sunbeams; and the Chickweed of our own climate will germinate in a temperature but just above the freezing point; while tropical plants require more than 100° of heat.

505. The effect of water is not only to soften the coat of the seed, so as to expand the nucleus, and free it from its integuments by bursting them, but it dissolves the nutritive substances it finds present, and becomes the vehicle of others. It also conveys oxygen, the presence of which is essential. By help of this, the carbonic acid is decomposed, the carbon set free, and the starch, dextrose, and other nutritive substances, are converted into saccharine matter, by which the embryo is directly nourished. Oxygen is also conducted by the air, which is another essential agent; for no plant can germinate without it. The active agents of germination are, then, Heat, Moisture, Oxygen, and Air; and a negative condition, also necessary, is *the absence of light*. All these circumstances are often found in a state of nature, where the seeds drop from the parent plant, bury themselves in the soil, and germinate, as in all cases of spontaneous production. But the ingenuity and intelligence of man secure to cultivated species the most favorable conditions, and thus multiply the chances in their favor.

506. When the radicle is protruded from its integuments, the lower extremity descends into the soil, the plumule, or opposite extremity, rises into the air, and puts forth leaves, while the radicle itself is stretched, or

The scar it leaves—what called in the Bean? Of what does Albumen consist? Where largely developed? How is it in the Sun-flower—Butter-nut—Coffee—Mallow? What does it contain? Is it present in the Pea and Bean? By what supplied? Office of the Albumen? Is it a simple substance? To the production of what part have all the parts and powers of the plant contributed? Why? What does it contain—how become a plant—its usual shape—

other forms? Describe the Aril. Instances. What is the first vital act in a plant? Most favorable circumstances. What temperature in our climate—in the torrid zone—frigid? Mechanical effects of water—Chemical effects? What other agent conducts oxygen? Active agents required in germination—what negative condition? After protrusion how are the extreme points of the radicle moved?

extended in its whole length, and forms the stem. The young plant is nourished by albumen, starch, and other nutritious substances contained in the seed, until it has developed a root and leaves, when it becomes entirely self-dependent, procures its own food, and elaborates the substance of its own tissues. But as starch is insoluble in cold water (57), and the vegetable tissues cannot take up solid particles, this highly nutritive substance, being acted on by certain azotized substances contained in the seed (71), is decomposed, and converted first into dextrose, which, you will remember, is soluble in cold water, and then into sugar. In most dicotyledonous plants, the cotyledons rise out of the ground, and, expanding into a pair of thickened leaves, as in the Garden Bean, fig. 16, contribute to the nourishment of the young plant, not only by their fleshy substance, but by developing chlorophylle (65). The germination of a monocotyledonous plant is well shown in the Oat, fig. 19, and the Maize, fig. 17; and that of a Dicotyledonous plant at fig. 16.

507. The periods that elapse between the times of planting and germination in seeds, range from a few days to two years. Cabbage will germinate in two days, the Turnip in three, Grasses in a week, Hyssop in a month, some Pines in a year, and the Holly in two years.

508. Since the facts of this chapter embrace many principles which are dry and difficult in their very nature, they may be made more familiar by reviewing them collectively. The SEED consists of a Nucleus and its Integuments. The external Integument is the Episperm, the interior one the Endosperm, the latter not always being present. The parts of the Nucleus are the Albumen and Embryo, the albumen not always present. The opening in the integuments of the ovule is the Foramen; the part to which it is attached is the placenta; the stalk which unites it to the placenta is the Funiculus; the base of the ovary which is joined to the funiculus, and in separating leaves a scar, is the Hilum; and the point from which are sent off nutritive vessels between the nucleus and its integuments is the Chalaza. The nucleus receives the influence of the pollen through the foramen, and its nourishment from the placenta, through the funiculus. In fig. 10, which represents a vertical section of the Garden Pea, *g* is the embryo, *t* its common axis, *r* the radicle, *m* is the foramen, *te* the episperm, *e* the endosperm, *c* the fleshy cotyledon, *ch* the chalaza,

rap the nutritive vessels, and *pl* the placenta. The cells containing albumen and starch are seen in the seed of Rye, fig. 15. At fig. 9 is seen the whole fruit of the Pea. Its parts have lately been explained. Recall them.

DISSEMINATION OF SEEDS.

509. Many circumstances assist in this great work. The plumose appendages of the Compositæ, of which the Thistle-down is a familiar instance, waft the seeds through the air, often to a great distance. A seed of the Robin's Plantain, one of this Order, was carried across the Atlantic in a stuffed bird, about the middle of the seventeenth century, and now it has overspread all Europe. A similar instance of exotic dissemination is furnished by the Cardoon Thistle, which is native of Southern Europe and Northern Africa. The seeds of this plant having been conveyed by some means to La Plata, its progeny have overspread the great Pampas of the Cordilleras, for nearly two hundred miles in every direction. They cover whole tracts so closely with their stout stems and spinescent leaves, that no animal can get through the impenetrable barrier, which is sufficient to repel an invading army. The seeds of many others of the Compositæ are furnished with hooks and spines, which adhere to the fur of animals, and to other bodies; while those of the Ash, Beech, and Maple, spread their wings, and fly abroad on the same great errand. River and ocean currents also assist in the dispersion of seeds. Those of the Cocoa-nut and Mahogany are transported from tropical America to the North Cape, and many others make similar voyages. Some flowers, as the Balsamine, fig. 9, have elastic pericarps, which in bursting scatter the seeds at a considerable distance. Seeds are also carried in the stomachs of birds, or they are stored up by animals for their winter food, and thus planted at a distance from the parent soil; and in this way forest trees are often propagated. Even little children, as with their light breath they blow away the downy seeds of the Thistle and Dandelion, or slyly fasten the hooked Burdock fruits in each other's clothes and hair, are unconsciously assisting in this great work of the Creator.

LONGEVITY OF SEEDS.

510. Some seeds lose their vitality almost as soon as they fall from the plant, but many are very tenacious of life. The seeds of Grasses often preserve their vitality for a long period. Maize and Rye will germinate after

stances assist in dissemination of seeds? How in the Compositæ—the Balsamine—Winged seeds? What effect have river and ocean currents—birds—quadrupeds—sports of children? Fact of Robin's Plantain—of the Cardoon Thistle? Comparative longevity of seeds? How in Grasses, Maize, and Rye,

Is the Primary Axis Root or Stem (115)? By what is the young plant nourished—how long? Why will not the vegetable tissues take up starch? Under what form will they do so? In what plants do the Cotyledons rise out of ground—what form—how useful? How soon will the Cabbage plant germinate—Turnip—Grasses—Pines—Holly? Recapitulate. What circum-

thirty or forty years, and Kidney-Beans retain their life-principle for a century. Seeds with hard and thick covers, or crusts, generally keep much longer; while those of fleshy and pulpy fruits are extremely perishable. Dr. Lindley, the great Botanist, raised raspberry plants from seeds which were taken from the stomach of a man, whose skeleton was found thirty feet below the surface of the earth. The body had been buried with some coins of the Emperor Hadrian, and it is probable that the seeds were about seventeen hundred years old. When a deep layer of earth is turned up to the air, seeds which have been buried from times unknown will germinate, and often present entirely different species from any in the neighborhood. Within a few years, grains of wheat, obtained from the Egyptian catacombs, where they had lain not less than three thousand years, have been planted in England, germinated, and produced abundantly.

511. Thus does the ALL-GOOD, the ALL-WISE, guard the life that he gives, not only by throwing around it innumerable barriers, but by placing its whole force and power in direct antagonism with Death, so that all its instincts and constitutional tendencies repel decay, and to the last moment resist dissolution.

CHAPTER XXXI.

SENSIBILITY OF PLANTS.

512. CERTAIN motions are observed in plants, which, as they are not to be referred to the operation of any mechanical laws, must be attributed to the existing vitality under the influence of peculiar conditions, or to the presence of a certain *sensibility*, which plants as well as animals inherit by virtue of their life. But the latter being destitute of muscular fibre, have nothing in common with that property in animals which has been defined as voluntary motion; yet they often exhibit movements which have a certain correspondence with it. These are of two kinds, general and special. The first belong to all plants; the last only to certain Orders, Tribes, or Individuals. Among the first may be reckoned the universal determination of the Root to descend, and of the Stem to ascend in germination, the turning of the upper surface of leaves to the light, and the tendency to exhibit as much of the plant as possible to the influence of that highly vitalizing power, in the position both of

leaves and branches, which evidently seek to expand themselves to the light always, and are especially directed towards it in obscured situations. Vertical leaves (252) hardly form an exception to this, because their surfaces being alike, they are equally acted on by the light, and their motions are not observed. To the second class may be referred the closing of flowers at particular hours of the day, the folding of both leaves and flowers at night, or in cloudy weather, the many curious movements for the dispersion of the seed and pollen, and various other phenomena which will now be defined.

513. MOTIONS CAUSED BY LIGHT.—The leaves of many plants, and especially those of a pinnate form, assume certain positions with the decline of day. These motions, which are exceedingly varied and beautiful, cannot be mechanical, for the leaflets generally bend upward, or forward, as in one leaf at Plate XXIX., fig. 5; and this, as it may easily be seen, is not a position they would fall into by their own weight. Plants with very delicately winged (279) or ternate (281) leaves, appear more sensible to this influence, such as the White Locust tree and the Wood-Sorrel, both of which afford fine subjects for studying these curious phenomena. The sensibility appears to reside in the joint of the leaf-stalk, which is usually bent down in the nocturnal position, the mode of folding being always uniform in any given species. These habits, collectively, were by Linnæus poetically denominated the "Sleep of Plants."

514. PAPILIONACEOUS FLOWERS (403) expand their wings to the air and light in fine weather; but many of the tribe close their petals at night, and in cloudy weather, some of them receiving additional shelter by the folding over them of their pinnate leaves. The Tamarind tree, which belongs to this family, is thus doubly enfolded by its protecting organs. The Lettuce, Dandelion, and many of the Compositæ, have the same habit. Our common White Pond-lily rises and expands with the sun; but on the approach of night closes its numerous petals and sinks below the surface, to rise and re-expand them on the following morning; and this it continues to do until the germ is fertilized, and the flowers fall. The celebrated Lotus of Egypt, which is seen at fig. 4, was described by Theophrastus and Pliny as having the same habit, and it is found in the same genus. The Victoria Regia of Guiana, belongs to a nearly allied genus, and is the largest Water Lily known. It is seen at fig. 9 with

Seeds with hard crusts? Raspberries of Dr. Lindley. Wheat from the Catacombs? Relate each. What guards of Life?

General subject. To what are certain motions to be referred—not to be referred? Of what animal property are plants destitute? What do they have corresponding with it? What kinds of sensibility? Define each class, with

instances. Motions caused by light. What leaves most sensible to its influence—how affected at night—fall—in what part does the sensibility reside? Instances. What term applied by Linnæus? How are Papilionaceous flowers affected? How the Compositæ? Instances. Habit of the Water-Lilies—define. Describe Victoria Regia.

its immense leaves, where the pelican and sand-piper walk, and fish without wetting their feet, and monstrous serpents coil themselves amid the rank verdure of those great solitudes, that nurture at the same time the most beautiful and the most terrible forms.

515. The Evening Primrose begins to unfold its flowers directly after sunset. The leaves of the calyx burst and fly open, with an audible report, emitting at the same time a very agreeable odor. The straw-colored petals unfold themselves more deliberately; and the flower fades during the next day. The Morning Glory and some of the Portulacca and Cistus tribes open with the early dawn, and close at evening; the *Mirabilis* generally is out about the middle of the afternoon, whence its common name of Four-o'clock; while the flower of the Goat's-beard regularly expands in the morning without regard to the weather, and closes about twelve o'clock; and for this reason is called Go-to-bed-at-noon. Many species of Trefoil in plants of the Clover tribe fold their leaves on the approach of a storm. The Chick-weed (*Anagallis*) closes its flowers, while the Sow-thistles open theirs on the approach of a storm. Many other instances might be given; but you will seek them for your own benefit, which will thus be greatly enhanced.

516. MOTIONS CAUSED BY TOUCH.—One of the most remarkable instances of this kind is the Sensitive Plant (*Mimosa*), which is represented in fig. 3. If one of the leaflets be touched, it seems to shrink from the hand, and rising with its corresponding leaflet, each closes on its mid-vein (263), and the pair being folded together, the motion is communicated to the adjacent pairs, as at the left hand in fig. 3, until the whole leaf is folded, when it sinks down on its stalk, as in the right-hand part of the figure. The Venus' Fly-trap (*Dionaea*) exhibits a very remarkable instance of irritability. If an insect alight on the blade of the leaf, which is thickly fringed with strong bristles, the two sides of the leaf suddenly spring together, the bristles cross and interlock each other, like the teeth of a steel-trap, the fly is imprisoned, and by its struggles to escape it is only bound more closely; nor will the prison open until the fly is dead. The stamens of the Barberry, in the mature state, are so exceedingly irritable, that if you touch the base of the filament with the point of a pin or penknife, it instantly springs toward the pistil, and discharges its pollen. In this manner, the feet of insects contribute to the work of fertilization.

The motions of the stamens in the Mountain Laurel, and some others, are to be ascribed to mechanical means, the anthers of the Laurel being confined in their little cavities or cells of the corolla by a glutinous substance, which is absorbed by the anther as it approaches maturity; and when no longer held, like a strained bow, they restore themselves by an elastic movement, and thus scatter the pollen in the direction of the stigma. The elastic motions of certain fruits, as the Balsamine and Squirting Cucumber, are also imputed to mechanical agency, rather than irritability.

517. SPONTANEOUS MOVEMENTS.—A species of Trefoil (*Desmodium gyrans*) exhibits the most remarkable motions of this kind. Its two small lateral leaflets, as seen in fig. 1, are in constant motion day and night, exhibiting constantly a series of violent little jerks, one rising while the other falls; but the large terminal leaflet is not affected by these motions, for it only changes its position, like the leaves in most of its tribe, at night, restoring itself in the morning. Cold, and especially the application of cold water, will for a time arrest these curious movements, but they are renewed with the return of warmth. Several other plants exhibit similar phenomena.

518. MOVEMENTS OF SPORES.—Many of these, especially in the lower orders of Algæ, exhibit very remarkable peculiarities of motion. In some instances they swim about in the water, vibrating their cilia with very curious and rapid motions, not unlike those of some of the lower Polypes, until they are ready to germinate, when they fix themselves, and begin to grow.

519. EFFECT OF POISONS.—That plants really possess sensibility analogous to that of animals, is shown by the effect of poisons. Not only will mineral poisons, on being absorbed by the root, produce death by corroding the tissues; but vegetable poisons will also destroy life, without altering the tissues. Yet there is nothing like the nervous system of animals to be found in the vegetable constitution. The poison must act through this sensibility, which represents or shadows forth the nervous system of animals, and which, like it, is found to be affected in various lower degrees by stimulants and narcotics.

When and how does the Evening Primrose unfold? Cistus—Portulacca—Morning-Glory—Mirabilis—Goat's-beard. What common names applied? What plants close before a storm? What keep open? What plants affected by touch? Describe the process in Mimosa. Describe the irritability in

Venus' Fly-trap—in the Barberry. To what may that of the Mountain Laurel and some others be referred? Describe spontaneous motions. Remarkable instance. Describe. How in the Algæ? How do mineral poisons affect plants—vegetable poisons—what does it prove?

CHAPTER XXXII.

GEOGRAPHICAL DISTRIBUTION OF PLANTS.

520. MATERIALS of this very interesting and important branch of the science have been gathering since the days of the early Botanists; for among the scientific observations which they made and recorded, was that of the *place* where a new plant was found. In the year 1700, Tournefort, who had been sent to Greece and Asia Minor for the purpose of scientific observation and discovery, noticed, while ascending Mount Ararat, that gradations of temperature occurred, similar to what he had observed in travelling from the Levant to Lapland; and in that observation the great fact was developed, that *height above the sea has the same effect on temperature as distance from the equator*; and hence that the mountains of torrid climes will exhibit the climatic conditions of every zone. About the year 1806, Humboldt, while investigating the relations between the distribution of plants and the temperature of climates, conceived the ingenious idea of connecting all those countries of the same mean temperature, by what he termed *ISOTHERMAL LINES*, or *lines of equal heat*. He found that while they sometimes diverge greatly from lines of latitude, they form far better boundaries of vegetation than any lines which merely indicate distance from the equator. About the same time, Adanson observed that there are few, if any, Umbelliferous plants in the tropics; and from this, observations continued to be made, with still increasing accuracy, until the earth was mapped out into distinct regions, or Floras, which often bear the names of their definers. Of these let us now take a brief survey.

521. Of the 110,000 plants known, the greater portion are indigenous to tropical America. Europe contains about half the number; Asia, with its islands, less than Europe; New Holland and the Pacific islands still less; and Africa fewest of all. One curious fact has been observed, that similar forms, yet not identical species, are often found in corresponding latitudes of different countries. Thus the Cacti of tropical America, not a single species of which is indigenous to the Old World, are represented by the leafless Spurge-worts of the corresponding parched and torrid regions in the East. The European Daisy is not to be found in all America, while its place is supplied by various species of Aster, some of

them closely resembling it, and belonging to the same Order. Again, the Heath-tribes overspread the whole Eastern continent, only leaping over the torrid portion, from the southern point of Africa to the frigid region of the North Cape; while not a single species is to be found in all America. Yet most others of the genera belonging to the same Order (Ericaceæ) are far more numerous than they are in the Old World. Several of these are peculiar to the New; and one tribe in particular—the Whortleberry tribe—is very widely and profusely scattered. Islands generally have the vegetation of the nearest continents; but if far from the mainland, they are marked by a peculiar vegetation. St. Helena, standing alone in the midst of the ocean, out of sixty-one indigenous plants, has only two or three that are to be found elsewhere. Few social plants, such as the Grasses and Heaths, are to be met with in the torrid zone. The most favorable conditions of the Grape are found between 30° and 45° of north latitude, and there the best wines are made. Wheat is cultivated as far north as 60°; but in the torrid zone, it will not form an ear at less than 4500 feet above the sea. Different seas also have their peculiar vegetation. Such vast quantities of a certain species, called Gulf-weed, are produced in the Gulf of Mexico, that banks are formed, through which it is difficult for ships to pass; and shallow seas have different plants from those which are deeper and colder.

522. THE ARCTIC FLORA (*Region of Wahlenberg*).—This comprehends all the countries within the Polar circle. It extends from the region of eternal snows, or the summits of high mountains, down to the limits of the growth of trees, and is distinguished by the tufted forms of its plants, which often have large and conspicuous flowers, as the Poppy and Crowfoot, and by the *entire absence of trees*. In the extreme north of this region, the dreary snow-plains are sometimes overspread for miles with the Protococcus, whose carmine bloom tinges the sparry surface with the warm glow of sunset. Here, too, before the short summer appears, other plants are seen vegetating under the snow. They melt the snow in immediate contact with themselves, the upper strata of which being thus converted into a transparent sheet of ice, through which the beams of the sun shine freely, form a kind of natural hothouse. Thus protected from the fiercer cold, the plants continue to flourish until the

General subject. How long have its materials been accumulating? What observation generally recorded? Observation of Tournefort—when made? Define. Idea of Humboldt—define—when conceived? Observation of Adanson. What progress since? How many plants known? Of these how many found in Tropical America—Europe—Asia and its islands—New Holland and the Pacific islands—Africa? What curious fact observed? Instances. Of which continent is Heath a native? What nearly allied genus—where found?

What vegetation have islands generally—when far from main land—St. Helena? In what zone are few social plants? Most favorable condition of the Grape? How far north is Wheat cultivated? How low on mountains of the torrid zone will it form an ear? Do all seas have the same kind of vegetation? What of the Gulf of Mexico? What other differences? The Arctic Flora—whose region? Define its limits—by what distinguished? What red-flowering plant? Natural hothouses.

chains of Winter are broken, and the transient summer appears. Lichens and Mosses are abundant; and this is styled the Region of Mosses and Saxifrages. In the southern part of this zone, on the extreme limits of culture, in Lapland, Barley is grown.

523. REGION OF LINNEUS.—This unites with the last at the line where Birches, in the form of low shrubs or bushes, begin to appear, gradually becoming more like arborescent forms, until Pines and their kindred tribes are mingled with them, giving their name to the region, which is often called the ZONE OF CONIFERS. It includes all Northern Asia and Europe, except what was taken up by the last. Firs, Pines, and Larches, form immense tracts of forest land; deciduous trees (315), as we advance, are intermingled with these; the Willow and Alder, with a variety of Sedges, skirt the brook-sides; the Cranberry flourishes in boggy soils, and the Cloudberry and Currant in more genial situations. The Reindeer Lichen and Iceland Moss, which is also a Lichen, over-spread the dry hills; and along with the tufted vegetation of the extreme North, appear the Cress and Fennel tribes, with some of the Compositæ, as the Dandelion and Lettuce. In the lower regions of Lapland and Siberia, Rye appears beside the Barley, but is confined to favorable seasons. In Norway, Sweden, Finland, and Russia, it is the staple bread corn, and Buckwheat is cultivated to a considerable extent. Again, in the north of England and Germany Wheat appears, and thence southward is the chief grain cultivated over that large tract of the continent stretching away to the Caspian Sea. In the neighborhood of Drontheim, a city of Norway, 270 miles north-west of Stockholm, fruits begin to be cultivated. Soon after this the Oak appears, and vegetation gradually expands into a rich and varied Flora, marked by the luxuriant Meadows and broad Heaths of England, the Moors of Scotland, and the Salt Steppes of Russia. In Zealand, the beautiful and fertile island on which the capital of Denmark is situated, the first woods of Beech appear, and Rye is accompanied by Wheat. In about the latitude of Frankfort-on-the-Maine, the noble Chestnut is first met with; and the Lime, Elm, and other deciduous trees, beautify the scene. The Hop, Clematis, and Ivy, foreshadow the climbers of the tropics; the dense and gloomy shadow of furzes is alternated by verdant mea-

dows and richly cultivated fields; extensive vineyards ripen their purple clusters in the mellowing sunbeams; Man has usurped the dominion of Nature; and a general cultivation, at least of the European side, is manifest. But we have reached the southern limits of this zone, and in crossing the great natural barrier of Caucasus and the Alps, we arrive at the

524. ZONE OF EVERGREEN WOODS (*the Region of De Candolle*).—It is distinguished by the abundance of evergreen trees, with coriaceous or shining leaves, as the Orange and Myrtle, which are intermingled with the graceful Palmetto of the tropics, and the Mint and Pink tribes among herbaceous plants. The Narcissus and Hyacinth bloom in spring; the clambering Vine hangs its purpling fruit among the glossy foliage of the woods; and the gorgeous Trumpet-flower, equally aspiring, relieves the deep shadow with its flaming tubes. Here Wheat is the principal bread corn, and is accompanied by Maize; the Olive and Grape attain their highest perfection, and some of the tropical fruits begin to be cultivated in the open air. This region embraces Southern Switzerland, Southern France, Spain, with all the great Basin stretching away from the Alps to the Atlas, including the three peninsulas of Southern Europe, Northern Africa as far as the Deserts, a considerable portion of Asia Minor, the Canaries, and the Azores.

525. JAPANESE REGION.—The temperate regions of Asia, including China, Chinese Tartary, and Japan, probably form a peculiar region, but their Flora is little known. What facts have come to light show a resemblance to the New World not less than to the Old. We find also a growing likeness to the tropical and Indian Floras, in the Banian, Palm, and Ginger tribes; and from the prevalence of such plants, it has been termed the Region of Honeysuckles and Buckthorns.

526. THE ORIENTAL TROPICAL ZONE.—This extends over both of the Indian peninsulas, and over the Islands between Asia and New Holland. Here we find the great Fig tree extending itself into a forest; the aromatic Lilies, such as Cardamom and Ginger; the Spice-trees, Cinnamon, Clove, and Nutmeg; the Sugar-cane, Indigo plant, and Cotton. Rice is the staple bread corn, while the lofty and noble Palm trees give their peculiar character to the landscape.

What other name of the region? Where does Barley first appear? Name of the next zone—whose region? Define its limits. By what chiefly distinguished? What Lichens? What other plants? What grain appears beside the Barley? In what countries is Rye the staple bread corn? What other bread corn also cultivated? Where does Wheat first appear? Where do Fruits begin to be cultivated? Where does the Oak first appear—the first Beech woods—the Chestnut—the Lime and Elm? What climbers—and what do they prefigure? What great changes in vegetation? What plant with pur-

ple fruit? Southern limit of this zone? Name of next zone—whose region? By what distinguished? What tribes among herbs? What climbers? The principal bread corn—by what accompanied? Define the limits of the zone? What of its tropical fruits? Name of the next region? What countries included? What do its plants resemble? What resemblance to tropical Flora? What is the region called? Why? Name of the next zone? Define its limits. Enumerate its characteristic plants. Staple bread corn? Characteristic trees?

527. REGION OF THE MYRTLE AND ACACIA.—This embraces New Holland. Forests of a dark and lurid green, their stiff, shining, and spear-like leaves cutting the light with their sharp edges, or reflecting it from their glistening sides, give a spectral character to the woods. This is a land of anomalous forms and uses. Here the Cherry grows with a stone on the outside; the Pear is wooden, with the stem at the small end; the Myrtle is burnt for fuel, and the Mahogany is used for making fences. In the Eucalyptus and Acacia tribes, the edges of the leaf are presented to the light, and these, with the Myrtles—which by a twist in the petiole throw theirs into the same position—compose almost the entire forests. Many plants of this region are much sought by florists, but none more than the Proteaceæ, that exhibit the most varied forms of grace and beauty, of which more than four hundred species are known. Among sea-plants is the exquisite frond of the Claudea, which appears like a cluster of the softest plumage; among Mosses, the Dawsonia, which is crowned by a tuft of soft and silvery hairs; and among Lichens, the Netispora, whose perforated thallus resembles the most delicate lace. The New Holland Lily, even in greenhouses, grows to the height of twenty-five feet, crowned with a spreading cluster of richest crimson flowers; and last, though not least in importance, is the New Zealand flax, which, in the fineness and strength of its bass fibre, is one of the most valuable plants in the world. In the parts occupied by the British settlers, the products grown at home are cultivated to equal advantage; but Wheat, Maize, and Potatoes are the principal crops.

528. REGION OF FIG MARIGOLDS—*Southern Africa*.—The Iris and Wood Sorrel tribes are represented by numerous plants, while the heavy and swollen Fig Marigolds, the rigid Stapelias, the beautiful Heaths, and the metallic foliage of the glistening Silver-tree, give a peculiar character to the landscape. The products of the tropical Flora, as well as the Crowfoot, Pink, Rose, and Fennel tribes, are occasionally represented.

529. DE LISLE'S REGION.—Further north (leaving Madagascar and its neighboring Islands, which are peculiarly rich in Ferns) we ascend to the tropical portions of Africa. Here we find in abundance Leguminous

plants, Peppers, Passion-flowers, and Palms. Here the giant Baobab seems to stand still within the circling thousands of his years; the lovely Date-Palm ripens its grateful fruit, and woos with its feathery foliage the hot breath of the Desert; and the tender-leaved Acacias, fixed in the arid soil, extract from the torrid sunbeams the coloring of their golden flower. Maize, Millet, and Rice, are the staple bread corns, for which Yams and Potatoes sometimes afford a substitute; but cultivation is little known.

530. REGION OF ASTERS AND GOLDEN-RODS.—This embraces the northern part of the United States, and is chiefly marked by the multitudes of plants from which it derives its name. It is also distinguished by the gigantic Plane and beautiful Tulip-tree, by the great variety of Oaks, Firs, and other deciduous and cone-bearing trees, by the few Umbelliferous and Cruciferous tribes, by the entire absence of Heaths, and the presence of numerous species of the same Order in the Whortleberry tribes. Wheat and Maize are the staple bread corns; and all the common products of the temperate zones are cultivated to advantage.

531. REGION OF MAGNOLIAS.—This, too, is the transition zone of the New World, and corresponds with the Zone of Evergreen Trees in the old; but we find fewer of the Mint and Pink tribes. Here the Live-Oak and majestic Cotton-wood attain their perfect development; and garlanded with the long gray mosses, give a peculiar character to the scene. On the Uplands the beautiful Magnolias and Horse-Chestnut expand their broad and glossy leaves, and open their splendid flowers, while in the dark swamps, which are scooped out into widely-stretching basins, the Cedar stands on its ancient buttress, the sentinel of unknown ages. As we advance southward the tropical character of the vegetation becomes more apparent; the Palmetto appears, with many parasites, and other climbers; Oranges are cultivated in the open air; Maize is the chief bread corn; and Sugar, Rice, and Cotton are the staple products.

532. REGION OF CACTI AND PEPPERS.—This includes the lower part of Mexico, the West Indies, and all inter-tropical America. The first of these tribes belongs exclusively to America; and only a few individuals of the

Name of the next Region? Define its limits. What anomalies? What peculiar character of its forests? What use of valuable woods? In what tribes are the edges of the leaves presented to the light? How in the Myrtles? What tribe much sought by Florists? What beautiful sea-plant—Moss—Lichen? Describe and name each. Describe the New Holland Lily. What valuable plant—where lies its value? What products in the British colonies—principal crops? What Region next—where found? What tribes numerous? What other tribes, and peculiarities of each? What remarkable tree? What Flora, and what tribes, occasionally represented? Next Region—where?

What plants numerous in Madagascar and its neighboring Isles? What tribes found in abundance? What large tree—what beautiful trees? Staple bread-corns? What important roots cultivated? Is cultivation greatly advanced? Next Region—what embrace—by what chiefly marked—by what other features distinguished—staple bread-corns? Next Region—with what zone corresponding—what tribes fewer—what fine trees—by what chiefly distinguished? What change in advancing south? What beautiful tree? The chief bread corn? The staple products? Next Region—what countries included—by what distinguished? Which tribe belongs exclusively to America?

second are found elsewhere. Here the gorgeous Passion-flowers, and a thousand parasitic climbers crush the strongest trees in their deadly embrace; Palms lift their august heads in the serene air; the graceful Cocoonut ripens its refreshing fruit; the Banana mellow its luxuriant clusters, and the richness of vegetation is inconceivable. As this region embraces the Southern Cordillera, it is, in respect to height, marked by several distinct bands of vegetation. In ascending the Andes, in Peru, we meet with the Cinchonæ, or medical-bark trees, which, according to Humboldt, is the middle region, and the zone of Whortleberries, the latter marked by many species of Gentian, Sage, Saxifrages, Sedges, several European Grasses, and in the lower parts the Oak and Fir. In Peru, and perhaps also in Mexico, the Potato is indigenous, and is still seen growing wild, appearing to delight in rocky cliffs near the sea.

533. REGION OF ARBORESCENT COMPOSITE, or of Asters with tree-like stems. This occupies Buenos Ayres and the Eastern temperate regions of South America. The Flora of this district agrees in many respects with that of Europe, while it differs greatly from that of the Cape and New Holland; for the Iris, Geranium, Myrtle, and Protean tribes are either wholly wanting, or very few in number, the distinguishing feature being that which gives its name to the region.

534. THE ANTARCTIC REGION embraces the countries around the Straits of Magellan. Here the Arctic polar forms re-appear in the numerous Saxifrages, Gentians, and Primroses; and there is a resemblance to the Floras of the American Highlands and the Cape.

535. INSTANCES OF PARTIAL DISTRIBUTION—*not dependent on climatic conditions*.—While the most numerous species and tribes of plants, and their allies, are generally distributed in corresponding degrees of climate, or altitude—often spreading over whole countries, and disappearing only to reappear in widely severed zones, there are certain species which never transcend the narrow limits to which they are either by Nature or Habit confined. Thus in a little cluster of Islands, the Moluccas, the Clove is found, and nowhere else; confined to a narrow girdle of the Andes flourish the race of Peruvian-Bark trees; on three small Islands of Africa the Double Cocoonut tree; in a little corner of Asia, the Tea shrub; and almost within the confines of a single mountain, still lives, though in apparent decay, the

famous Cedar of Lebanon. Are these the remnants of numerous races, which in times past have been widely scattered, and now, like certain races of men, are falling into decay, and disappearing from the Earth? We question the Past; the long-gone Ages hide themselves in the still deepening shadow, and are silent. We question the Future; and the great silence behind seems to vibrate beyond, as if with a kind of dumb echo; and in the mute answer we gather only this, that in the living Forms of the Present are bound up all the wisdom of the Past, all the knowledge of the Future, so we only study them faithfully, and interpret them truly, *by the light we have to-day*.

CHAPTER XXXIII.

ECONOMICAL USES OF PLANTS.

536. THE most important plants, and parts of the plant, I will now, briefly as possible, attempt to classify and present to your view, beginning at the Root, and ascending to the Seed.

USES OF THE ROOT.

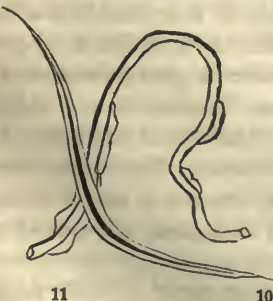
537. For the sake of brevity, and because they are popularly known as such, I have ranked all subterranean parts under the head of Roots in this classification, which is one of mere convenience, and will in nowise contradict the arrangement (238) by which the Bulb, and various other subterranean modifications of the growing axis, are now ranked among Stems.

538. The nutritive properties of the Root consist chiefly of *starch*, which is stored away in its receptacles for the support of that second year of growth, which almost all greatly thickened roots are constituted to sustain.

539. ROOTS AS A SUBSTITUTE FOR BREAD.—First in this rank comes the Potato, which was originally a small rank tuber, native of Peru, but is now cultivated, more or less, over the whole civilized world. The Sweet Potato is a *Convolvulus*, and belongs to the same genus with the common Morning-Glory. It forms a staple article of food in several of the South American countries, especially Guiana. The Manioc root, from which Cassava bread is prepared, is one of the most important articles of food throughout all tropical America; and

Mention some of the characteristic plants. How on the Cordillera? What zones mentioned? By what is each distinguished? What valuable root native, and of what parts? Next region—what lands does it occupy—by what plants distinguished? With what does this Flora agree in many points—from what ones greatly differ? Next Region—what countries embrace? What

forma reappear—what Floras resemble? How are the most numerous species and tribes generally distributed—how certain species? What tree confined to the Moluccas—to a small girdle of the Andes—to three small African Islands—to Mount Lebanon? What shrub to China? What thought suggested—questions—reflection?



In fig. 7 is seen the Pitcher-plant of the East (*Nepenthes*), while at fig. 8 is one of the pitchers enlarged, with the lid thrown back. Fig. 2 represents Venus' Fly-trap (516), with two of the leaves closed, while a third is open at *a*, showing the irritable points between its lobes, which, on being disturbed by an insect, spring together and imprison it. At fig. 15 is a very delicate drawing of the Sugar-Cane (*Arundo*), and at fig. 16 two Starch-cells are represented, with

2 distinct grains at *b*, showing the structure. What remarkable instances of sensibility—by which figures represented? Define and explain each. Which plants affected by light—which by touch—which by spontaneous motions? What remarkable trees? What shown by figs. 10, 11, 12, and 13? Which are vegetable products?

not the least wonderful part of its history is, that the same root furnishes a wholesome and excellent bread, a deadly and virulent poison, and a delicate and nutritious starch, which is the Tapioca of commerce. The Taro root (*Arum esculentum*) is the chief article of cultivation throughout the Sandwich and other Polynesian Isles, answering the double purpose of vegetables and bread. The acrid properties common to its family are dissipated by heat. The Yam is the root of a species of *Dioscorea*. It is either baked or boiled, and is a tolerable substitute for bread. It will keep longer out of ground than any other vegetable, and hence is proper for sea stores. The Ti-root is also a native of the Polynesian Islands; but unhappily its true use is perverted, it being often manufactured by distillation into an intoxicating drink. The natives assemble in whole neighborhoods for the purpose of constructing the still, and surrendering themselves to the exhilarating influence of the poison.

540. **ARROW-ROOT.**—This is a kind of very pure white starch, prepared from the roots of different species of *Maranta*. The West Indian article is best, and is said to derive its name from the fact that the Indians make use of the root to extract the poison of arrows. Arrow-root is also prepared from a species of *Arum*. All these are articles of nutriment or luxury; and they are extensively used in preparing dishes for the sick.

541. **ESCULENT ROOTS**, in general, are well known and widely diffused. Many of them, as the Beet, Carrot, and Parsnip, contain a large portion of saccharine matter; and from the former sugar is made in sufficient quantities to give it place among articles of commerce.

542. Many roots are possessed of aromatic, and at the same time medicinal properties, as the Ginger, Colombo, and Sweet-Flag. The two former belong to the tribe of Aromatic Lilies of the East. The plants are either of a deep glossy green, or of a warm yellowish green, soft and rich as velvet; and their flowers, which are put forth in great clusters, are of the most vivid and intense colors. The root of Ginger, it is hardly necessary to say, is largely employed as a spice, and also preserved in sugar as a sweetmeat, and used to flavor other sweetmeats.

543. Of the violet-colored bark on the roots of Guenbé, a climber of La Plata, a kind of rough cordage is made, which is much employed in local navigation. It will not bear friction like hempen ropes; but it is cheap, and serves a very good purpose.

544. The article known in commerce as Madder, is the prepared root of *Rubia tinctoria*. Madder contains several distinct principles of wholly different composition,

and affording different dyes, the chief or characteristic color being red, which, with different MORDANTS, or the substances that bind or set the color, becomes yellow, orange, brown, or purple. The colors from Madder are among the most permanent of vegetable dyes. This plant is cultivated in France and Belgium. Alkanet is the root of *Anchusa tinctoria*, a native of Southern Europe. A kind of reddish dye is extracted from it, which was formerly used for staining the face; and hence the origin of its name, which signifies a *rouge-pot*. Its coloring matter being resinous, is readily imparted to oils and alcohol; and hence it is used to color lip-salves and stain marbles. Turmeric is the root of *Curcuma longa*. It yields a fine yellow powder, which is used as a dye, and also in medicine, and the composition of curry powder. Paper stained with Turmeric is employed as a test of the presence of alkaline substances, by which its yellow color is changed to brown. The roots of many plants are rich in medicinal properties; and hence the *Materia Medica* draws largely on this part of the vegetable body.

USES OF THE STEM.

545. The first uses of the stem of plants, as manifested in the trunk of trees, are those of fuel and for building; but the purposes to which wood may be applied are innumerable. The most esteemed of ornamental woods are the Mahogany, a native of tropical America and Australia, Ebony, Black Oak and Black Walnut, Curled and Bird's-eye Maple, Cherry, and Birch. There are three varieties of Ebony, red, black, and green, the latter being used for coloring. The Ebony is a beautiful tree, native of Madagascar and Ceylon.

546. The Bamboo is an arborescent Grass, its jointed stems often growing to the height of seventy or eighty feet; and with its light and graceful foliage waving in the air, and its slender stems swaying with every breeze, it has altogether a character of beauty which nothing can exceed. Its uses, too, are numerous and important. From the lightness and durability of its wood, it furnishes an excellent material for many purposes. In the East Indies, where it grows abundantly, forming large jungles, it is used extensively in building houses, which will sometimes last a hundred years. Its tender stalks are boiled, and eaten as Asparagus; the small stems are used for canes, flutes, and umbrella sticks, and in the manufacture of chair-seats, sofas, and various articles of furniture. Cane is also used for boat-masts, carriages, boxes, and fences; paper is made from its macerated stalks; and it is converted into innumerable articles of use, ornament, or luxury.

547. The famous Cedar of Lebanon is a Larch; but unlike others of its tribe, it has evergreen, and not deciduous leaves. In the early days of commerce masts were made of it; and so highly was the tree esteemed by the Ancient Jews, that David speaks of its tribe as the "Cedars of God," which has been rendered in our version, "Goodly Cedars." The group remaining on its native mountains, to which it is now confined, is said to contain only about 800 or 900 individuals. The trees known as Cedars among us belong to a different family. One of them, the White Cedar, is much used in the manufacture of shingles, fences, and domestic wooden ware. Red Cedar is also used for making pails, tubs, and very largely in the manufacture of Lead-pencils. But of all kinds of wood, that of the true or oriental Sycamore is perhaps the most durable; and for this reason it was used by the ancient Egyptians for mummy chests.

548. CHARCOAL AND POTASHES.—Owing to the abundance of carbon which wood contains, it is largely employed in the arts, and for domestic purposes in a charred condition, all the volatile matter having been driven off by heat, when it is termed Charcoal, which is nearly pure carbon. From the ashes of the harder kinds of wood Potash is extracted, which, by higher degrees of refinement, is manufactured into Pearl-ash and Saleratus.

549. DYE WOODS.—The most valuable of these are Logwood, Brazilwood, Camwood, Barwood, and Fustic. Logwood grows in the West Indies, and is generally employed in dyeing black; but with different mordants it also yields different shades of red and purple. Brazilwood forms a beautiful red dye; and its habitat is sufficiently indicated by its name. Fustic is the *Morus tinctoria* of the West Indies and Tropical America, and yields a fine yellow dye. Camwood is found in Sierra Leone; and Barwood, which also colors red, in Angola and other parts of Africa.

550. The *Ferula* is a plant belonging to the Fennel tribe. The pith of the stalk, when dried, is used in Turkey, where it is native, instead of tinder; and also, because it will for a long time sustain combustion, to transport fire from one place to another. In allusion to this circumstance, Hesiod, speaking of the fire which Prometheus stole from Heaven, says he brought it in a *ferula*.

551. The Sola is an aquatic plant of Hindostan, whose stems, being extremely light, are applied to a very singular use. The native fisherman binds them into bundles, like great fagots, and with one of these under each arm, to serve as a buoy, or float—and without any

other protection—goes out boldly to fish in the deepest waters. Various articles, which are esteemed for their lightness, are also manufactured from the stems of this plant; and it is used to decorate the shrines at religious festivals.

552. The Sago of commerce is prepared from the pith of two species of Palm; and an oil extracted from a kind of Birch, and called "Birch-pickle," gives to Russia leather its peculiar properties and odor. The straw, or stalk of several Grasses is employed in the manufacture of hats and bonnets. That of Rye, in an immature state, is chiefly used among us, and is *split* before it is braided; but the beautiful Florence hats are wrought from the *whole* straws of a kind of grass native to the country. The bark of Birch trees is employed by the Indians to make canoes, thatch houses, and in the manufacture of various articles of ornament and convenience; it is also used by the Russians to make sails for boats.

553. Many barks, being rich in the astringent principle, are very important in the tanning of leather. The Oak and Hemlock are chiefly used among us; while the beautiful Morocco leather, in the manufacture of which the Moors so greatly excel, is tanned with a species of Sumach.

554. Cinnamon is the dried inner bark of the *Cinnamomum Zeylanicum* of Ceylon. It belongs to the same order (*Lauraceæ*) with our Sassafras. Cassia-bark, which in this country and Western Europe is almost always sold for Cinnamon, is the bark of another and inferior species of the same genus, native of China.

555. The Gall-nuts of commerce are excrescences formed by the puncture of a kind of *cynip*, in the tender shoots of an Oak of Asia Minor, the *Quercus infectoria*. Gall-nuts are used in the manufacture of ink and black dyes, and also in medicine.

556. BASS FIBRE OF THE BARK.—Our staple plants for the production of Bass fibre are the Flax and Hemp. From the first all our beautiful linens and fine cambrics are made, and from the last our cordage. The Silkweed, Indian-Hemp, and the Linden tree are also rich in bass cells; and in a country of fewer resources, they might be employed to advantage in the manufacture of cordage, and perhaps cloths. The beautiful Pina cloth is made from the bass cells of a species of wild Pineapple found in Mexico. In the Philippine Isles the bass cells from a species of Banana are used in the manufacture of various fabrics; in the West Indies a very beautiful lace is made, without spinning or weaving, from those of the Lace-tree; and in Tahiti, the Paper-Mulberry is

employed in the same way, and from it are wrought the most delicate and lovely fabrics imaginable.

557. But of all known plants, the New Zealand Flax (*Phormium tenax*), is the most valuable for the production of bass-fibre. Compared with our staples it has one third more strength than Hemp, and twice as much as Flax; and its toughness is only exceeded by that of silk. It is a liliaceous plant with long, narrow leaves, the slender fibres of which glisten like silk, and are white as snow. The plant is of easy culture, and thrives in every variety of soil. It flourishes well in the South of France, and similar climates, wintering in the open air. The great difficulty, however, thus far, is that the strength of the fibre is injured by maceration; and no machinery, or even hand-work, can as yet imitate the dexterity of the native women in separating the fibre from the coarser parts.

558. The Nettle worts are generally distinguished by very long and fine bass-fibres; and the German name for muslin, *NESSER TUCH* (*Nettle cloth*), as Schleiden tells us, denotes the source from whence its materials were originally obtained. The bass-fibres are remarkably different from those of cotton and wool, and have the nearest resemblance to silk. If any doubt is entertained in regard to the adulteration of either silk, woollen, or linen, by a mixture of cotton, an appeal to the lens will at once settle the question, which any one may see for himself, by examination of the figures 10, 11, 12, and 13, which represent respectively, fibres of linen, silk, wool, and cotton. From the Manilla Hemp, *Musa textilis*, the most exquisite textile fabrics are wrought, and the elegant Manilla hats are also manufactured. The well-known Broom-corn consists of the flowering branches, or panicle of the *Sorghum Saccharum*, an East Indian plant of the Grass tribe, but universally cultivated for the manufacture of brooms.

559. **USES OF THE LEAF.**—From some species of Palm leaves a great variety of articles are wrought. They are employed for thatching houses, for umbrellas, and to make baskets, hats, and for many other purposes. The leaves of the Papaw are used instead of soap to wash linen. Tea, which has become an article of prime necessity, consists of the dried leaves of *Thea*, a shrub of China. It is of two species, *Thea viridis*, Green-tea, and *Thea bohea*, Black-tea. The Paraguay tea, which, to the Central and South American, is an equal favorite with the Chinese beverage, consists of the dried leaves of a species of Holly. Henna, which is so much used by the oriental ladies for the purpose of staining their nails and eyelids, is a paste formed of the pounded leaves of

the *Lawsonia alba*. The drug known in medicine as Senna, is composed of the dried leaves of several species of Cassia; and a tolerable substitute is also afforded by a native species, the *Cassia Marilandica*. Woad, a blue dye, which is now mostly superseded by Indigo, is a product of the leaves of *Isatis tinctoria*, a cruciferous plant that grows wild in France, and on the coast of the Baltic.

560. **USES OF THE FLOWER.**—The drug known in commerce as Safflower, consists of the dried flowers of *Carthamus tinctoria*. It affords a beautiful red dye, and is also the basis of the finest pigments known as *rouge*. This is the species cultivated among us as Saffron. It is also used in Medicine. The true Saffron consists of the dried pistils of the *Crocus sativus*, which is also used both for dyes and medicine. Capers are the unexpanded flower-buds of the Caper bush, a low shrub growing in the clefts of rocks in Southern Europe, prepared for the table by pickling. From the volatile oils which they contain, the flowers of many species enter largely into the manufacture of Perfumes and Essences; and others, preserved in sugar, form conserves, which are used in Medicine. The Clove of commerce is the unexpanded flower-bud of a species of *Caryophyllus*, growing only in the small cluster of the Molucca Isles. The tree resembles a Laurel; it belongs to the Myrtle tribe, and it is said that no verdure is ever seen under it.

USES OF THE FRUIT.

561. The uses of fruits, generally speaking, being well understood and appreciated, require little explanation. They are, for the most part, considered articles of luxury, and enter far too little into the common food of the civilized world. Coffee is the berry of *Coffea*, a small tree, naturally growing from 16 to 20 feet high, but dwarfed in cultivation, for the convenience of gathering the fruit, to about 8 feet. Its very fragrant white flowers grow in clusters, and its leaves are of a shining light green. It is a native of Arabia; and the best kind is still considered to be that from Mocha, in Arabia-Felix. The fruit of the Olive yields the oil which is known by its name; and in the green state is pickled. The Chocolate of commerce is prepared from the fruit of the Cacao tree, a native of tropical America; and the pulp outside of the nut, in the *Sapindus*, a tree of South America, is used for soap, in washing linen.

562. **FRUITS USED AS BREAD.**—The principal of these are the Bread-Fruit and Cocoanut, natives of the Polynesian Islands; and with them the Plantain and Banana may properly be classed. There are 50 varieties of the Bread-fruit tree, the most important of which are the *Artocar-*

pus incisa, and the *Artocarpus integrifolia*. In preparing for the table it is thrown directly on to the fire, when the outside becomes charred, and the inside somewhat like a fresh loaf of wheaten bread, having a general resemblance to a roasted potato, and a slightly astringent taste, a little like the yolk of an egg. Of the Bread-fruits, Cocoonut and Banana fruits, many native dishes are compounded, some of which are said to be excellent. Among trees that yield substantial articles of food, the Date-Palm and the Fig should not be forgotten. The Tamarind is the fruit of two species, of *Tamarindus*, a lofty and beautiful leguminous tree, cultivated for its fine shadow in both the Indies, where also it is found native. The well known *Vanilla* consists of the fragrant seeds of *Vanilla aromatica*, a climbing vine, one of the splendid orchideous parasites which invest the trees in the swampy forests of Guiana.

USES OF THE SEED.

563. Foremost among these come the Cereal Grains, which, in affording the basis of bread, are more valuable in a dietetic point of view, than any other class of vegetable products. It should here be understood, that although these grains have been classed among fruits, which they really *are*, yet their value as food depends entirely upon the nutritive principles of the *seed* which they inclose. Leguminous seeds, such as those of the Bean and Pea, are also highly nutritive, and important articles of diet. Starch from the Potato, Maize, and Wheat, is extensively manufactured and employed in the composition of various delicacies for the table. The Nutmeg of commerce is the seed of a drupaceous fruit found in a species of the *Myristica*, a fine tree of the East Indies; and the scarlet aril, or appendage to the seed, is the substance known as Mace. The Oleaginous Seeds, or those producing oils, are very important in the Arts, and for many economical uses. The chief of these are the seeds of the Walnut, which produce what is called Nut-oil, the seeds of the Flax, which afford Linseed-oil, those of the Palma-Christi, a native of the West Indies, from which Castor-oil is made, and those of the Sun-flower, which afford a substitute for Lamp-oil.

564. There are many cases in which the *whole plant* is useful; and first among these come the Grasses, which not only spread the earth with a beautiful green carpet, but furnish food for herbivorous animals. The Iceland Moss is a Lichen, which, from the gelatin it contains, is much used in cookery; and so also, and for the same reason, is the Carrageen Moss, an Alga found both in this country and Europe. Archil is a purple dye ob-

tained from two species of Lichen called Rocello, which are found in the Canaries; and Cudbear is also a product of another Lichen, *Lecanora*, and yields a fine purple color.

565. SECRECTIONS OF PLANTS AND THEIR USES.—

These have been generally treated of in Chapter V., and can barely be referred to now. Resins, Gums, Gum-Resins, Balsams, and Wax, may be classed under one general head, as exudations, and are extensively used in Medicine and the Arts. Gum-Arabic and Gum-Senegal are the product of two species of *Acacia* found in Northern Africa and Asia Minor; Gum-Ladanum is an exudation on the leaves of a species of *Cistus* found in Turkey; and Pitch, Tar, and Turpentine, which are so valuable in the Arts, and for naval purposes, are resinous products of the Pine tribe. India-Rubber is the inspissated juice of several trees of the tropics, the chief of which is *Siphonia elastica*; and Gutta-percha is a similar product of a fine tree of the Indian Archipelago. Dragons-Blood is a kind of balsam flowing from the *Dracæna*, or giant Dragon-tree of the African Isles; and the Balm, or Balsam of Gilead, is procured from the *Amyris Gileadensis*, a plant of Syria. Wax is found in the tissues of plants, and sometimes as an exudation on the surface of the stem, as in the Wax-Palm, fig. 6, and of the fruit, as in the Bayberry. The wax or *tallow*, as it is most commonly called, of the latter, is used in the manufacture of Soaps, Candles, and in the composition of Salves. A Chinese tree, *Stillingia*, also furnishes wax, from which the natives make candles.

566. The milky juice of plants is often poisonous, and is sometimes of a virulent character. Among those which are distinguished by this peculiarity of the sap, are the Spurge-worts, Nettle-worts, and Dog-bane tribes, which afford the most terrible poisons known. The dreadful Wourari poison is prepared from the milky juice of *Echites*; while that of *Strychnos* and *Jatropha* furnish the liquid in which the Indians of Guiana and the Oronoco poison their arrows, investing them with such deadly certainty, that the least grazing of the skin is fatal; but in many plants belonging to these very poisonous tribes, the peculiar juices are not only harmless, but nutritious and wholesome. That of the *Euphorbia balsamifera* is similar to sweet rich milk; and being converted into a jelly by thickening, it is eaten as a great delicacy by the inhabitants of the Canary Isles. In the forests of British Guiana is found a tree, called by the natives Hya-hya, whose pith and bark are completely saturated with milk. This is of an agreeable flavor, sweet and wholesome, and is taken by the savages as a

refreshing drink. Nor less agreeable is the milk of the Ceylon Cow-tree (*Gymneura lactifera*), which the natives use exactly as we do milk. But by far the most interesting and remarkable tree of this kind is the Cow-tree of South America, *Galactodendron utile*, which first became known through the researches of Humboldt. When an incision is made in the trunk of this tree, a fragrant, oily, and sweet liquid flows forth, very similar to animal milk, and in sufficient quantity to refresh and satisfy the hunger of several persons. It is seen in fig. 14.

567. The sap of the Sugar-cane, the Rock-Maple, Birch, and some other trees, affords sugar. The drug known in commerce as Arnotto, and so much used for its beautiful orange dye, is an extract from the *Bixa Orellana*, which belongs to a genus of tropical shrubs, but attains the height of a large tree in Guiana. Varnishes are composed of resinous substances, dissolved either in oils or alcohol. The most important of these are the Copal, Shell-lac, and Turpentine Varnishes.

568. The beautiful coloring substance known as Indigo, is obtained from the fermented juice of *Indigofera tinctoria*, a leguminous plant, native of India. The Dyer's-weed, *Genista tinctoria*, is also a leguminous European plant, the whole of which yields a fine yellow, and, combined with Woad, green.

569. In fine, it may be said that there is no art known among us which does not depend on the Vegetable World for its materials, in some form or other; and there is no condition, or circumstance of life, which is not equally dependent. Plants are the great Chemists of the world; for by processes which the most learned Scholar in vain attempts to imitate, they transform crude mineral matter into the elements of organic forms. They are the FIRST WORKERS—the UNIVERSAL PROVIDERS. Stationed at the basis of all vital activity, they are continually extracting from the great Granary of the At-

mosphere the food of all living beings—THE ELEMENTARY AND SUSTAINING PRINCIPLES of all LIFE.

570. You have now completed the vegetable cycle, having reviewed the life of the whole plant, from the Germinating Seed, through the developed organism, Root, Stem, Leaf, Flower, and Fruit, to the seed again; and thus finally returning with it once more to the earth, you have reconsidered that wonderful process which lies at the basis of all life. I would ask you here not to regard this science as a huge bundle of dead Facts and severe Principles, which are bound together by strange and uncouth terms, but rather as a LIVING NUCLEUS, through which every individual mind may continually develope new truths, that shall be for ever quick with immortal life and beauty. Look not on plants with the hard and cold eyes of a mere Collector—a hoarder of dry specimens—but study their physiognomy, expression, character, significance, and power—in short, all that distinguishes them in the structure and combination of their several parts, their relations with each other, and with the world at large; for only in this mode of study can the mind attain to that free and generous expansion, which is the highest happiness. Be not wholly satisfied with this, or any other book of the kind, but STUDY NATURE. Those books are the best which present the clearest views of Nature. And when holding up the mirror to her beautiful face, in the bright glimpses they afford, even if they themselves are forgotten, still they do the most that books *can* do—for they attract to the more informing study of the Divine in Nature—the Wisdom, Beauty, and Love which, in all created forms, every where proclaim the goodness of the CREATOR. And of all these way-side Ministers of Blessing, who would not rather sit down and listen to the bright-eyed Flowers, that, with their odorous breath, for ever testify so lovingly of Him to whom we look up, in the name and blessing of all things, and call OUR FATHER?

PART II.

SYSTEMATIC BOTANY.

CLASSIFICATION OF PLANTS.

IN order to aid us in acquiring a knowledge of the properties and general characteristics of those plants which fall under our observation, some mode of classification is necessary. The advantages of systematic arrangement are the same here as in other sciences. It aids us in prosecuting our own researches, and in becoming familiar with a more widely extended circle of vegetation; and it is almost indispensable to us, in availing ourselves of the investigations of others. It also opens to us a new and most important branch of the subject, in the study of the various relationships of plants, and of their relative structure and development.

There are two kinds of classification in use, one founded on ARTIFICIAL distinctions, and forming a kind of *dictionary* of plants, the other depending upon NATURAL characters, or those derived from the plants themselves, and truly representing their affinities. The only advantage which an artificial method can possess, must be a greater simplicity and capability of being understood and applied. It does not, of itself, in any way increase our knowledge of plants, while it is a great obstacle in the way of all attempts to study and understand their mutual relations and affinities. A Natural method, on the contrary, while it can be made as simple as any to those who are acquainted with the physiological structure of plants, has this great advantage, that a comprehension of the mere system itself, increases our practical knowledge of plants, and especially of the various relations of their different tribes; and thus gives us much better and clearer conceptions of the vegetable creation. Indeed, without such a system, we could hardly

form any idea of it, viewed as a whole; or, at best, but a very imperfect and unsatisfactory one.

A Natural Method, then, merely recognizes, as the foundations of its classification, certain fundamental distinctions and affinities observed in the plants themselves. It is my intention here to explain the principles upon which all natural methods are formed, and then go on to describe particularly the chief divisions of the system of Jussieu, which, with amendments and additions by later Botanists, is now almost universally adopted.

The most important, and strictly natural arrangement, is that which distributes individual plants into SPECIES, and these species again into GENERA. The principles upon which these distinctions rest are so simple, and so obvious, that they are almost universally recognized, even by those unacquainted with the science itself. Hence they form the basis of all subsequent classifications; nor, since Botany has been studied scientifically, has there been any classification, however artificial, which has not recognized their existence.

A Species is a general name applied to *all those individual plants which have so near and perfect a resemblance, that they seem formed, in all their parts, closely after the same type, or model*. They must be such as could have descended from a common stock; or, what is the same thing, such as might be produced by the seed of any one of the individuals. Thus, if we go into a field of red Clover, we instinctively recognize the different individuals of the Clover, as belonging to the same species, because they are so obviously formed after the same model. We see at once that all these might have descended from a single individual, or that we might take the seed of one of them, and in time produce

plants differing among themselves as much as these, or even more. This, then, is the law in accordance with which plants are distributed into species. Whatever differences are merely accidental, produced by circumstances of climate or soil, and are not incompatible with this principle, may, and do exist, between individuals of the same species. Those differences, however, which are incompatible with a common origin of the individuals possessing them, become, in our observations, and in botanical descriptions, the most valuable and certain means of distinguishing between different species. Hence we may regard our description of a species as that of a type, or model, containing all those particulars in which all the individuals comprehended under that species must agree, and excluding all in which they may, and do differ.

Those forms which exhibit those unessential differences in size, color of the flower, and general appearance, produced by variations in climate, soil, or other accidental conditions, when they differ from the original type, either considerably in some part of their structure, or in general aspect and appearance, are termed *VARIETIES*. These varieties are distinguished from species, which preserve their peculiar characteristics under all circumstances, by their constant tendency to run into each other, and to revert to their original type. Hence, though we meet with varieties differing remarkably from the primitive types, we usually find numberless intermediate varieties, forming by almost insensible gradations, a complete and unbroken transition to the original character. The peculiarities of varieties, unlike those of species; are rarely transmitted, unchanged, through the seed; but plants grown from the seed of a single individual often present remarkable diversities. This is due principally to the unstable character of these peculiarities, but also to another fact, which forms the most certain and reliable test, to enable us to distinguish between what are really different species and what are merely different varieties of the same species. Varieties freely *hybridize* with each other, that is, the pollen of one variety, brought by winds, or by insects, often fertilizes the ovules of another; the resulting plant combines the peculiarities of both varieties, and is a hybrid, or *intermediate variety*. These hybrids, between different varieties of the same species, it must be noticed, produce seeds which are as perfect and as productive as any. This property the horticulturist often avails himself of, in raising new varieties of fruits or flowers, by combining in this way the merits of two previously existing varieties.

But if we undertake to compel really different species

to hybridize, the result is different. Either the pollen refuses to fertilize the ovules at all, and no seeds are produced, or if perfect seeds are produced, the plants grown from them either refuse to produce perfect seeds at all, or will do so only when impregnated with the pollen of one of the original species. Hence we see that no permanent hybrid, or variety, can be produced between two really distinct species. Any such forms, which may accidentally be produced, either die out without leaving behind them any progeny, or, in the course of a few generations, revert back completely to one of the original species. It is probable that if any really permanent hybrids have ever originated between two apparently distinct species, that these supposed species must have been really very distinct varieties of the same species which, under some accidental concurrence of circumstances and conditions, had retained so long their peculiarities, that these differences have assumed an unusual permanence, so as to be transmitted through the seed nearly or quite unchanged.

Such permanent varieties, when their characteristics are perpetuated through the seed, though quite rare among wild plants, are very common among those that are cultivated. These varieties are often called *RACES*. They probably arise much in the manner described above, and are usually most permanent in those plants which have been cultivated longest. Different countries, or different districts, usually cultivate different varieties, which have arisen under the influence of their climate, soil, and other peculiarities of situation. These varieties, however distinct from each other, or from the original type in their general appearance, hybridize freely with each other, and thus reveal their common origin and specific unity, as they also do by their tendency, when neglected, to revert to their primitive forms.

As a species consists of individuals formed after the same model, so a *GENUS* is a *group of allied species formed after the same general type, or model, and more closely related to each other than to any other species*. The differences between such species, though constant, are generally so few, and the plants usually bear so close a general resemblance to each other, that all, even the most ignorant, acknowledge their affinity by bestowing upon the whole group one general name. Thus the numerous species of the genus *Rosa* have always been known under the common name of *Rose*, while the particular species have been designated by some adjective, as the *White*, *Red*; or *Damask Rose*. So also in the numerous species of *Oak*, the family resemblance has always been recognized by the comprehensive name

bestowed upon the genus. The popular term Lily also comprehends many species, whose relationship is obvious to all. These may be taken as illustrations of the groups of species which constitute genera, and of the principles which control this arrangement. The number of species in a genus varies from several hundred in certain large genera, to a very few. One species, even, frequently forms as characteristic a genus, and one as obviously distinct as any of those consisting of many.

Sometimes in large genera, or in those where all the species are not very closely related to each other, those species which have the greatest affinity for each other, are placed by themselves in sections; and when these sections are quite distinct, and there are no intermediate species connecting them, they are called SUB-GENERA.

Allied genera also, by an extension of the same principle, are grouped into ORDERS. These, then, consist of genera, which, to a great extent, or in many of their most important characters, follow the same general type, or model, and which are more nearly allied to each other than to any other genera. These genera almost always bear such a general resemblance to each other, that their relationship is evident to all who are accustomed to use their faculties of observation. In many cases the affinity is so strong as to be recognized by all. Such orders are the Umbelliferous plants, including the Carrot and Parsnip tribe, and the Pine family, where the affinities of all its different members, in their various forms of Pines, Firs, Spruces, and Cedars, are universally recognized. In almost ALL cases, however, the practical eye of a Botanist is able at once to detect the true character of a plant, and to refer it to its proper order at the first glance. Orders, like genera, may consist of many members, or few. A single genus, even, sometimes forms an order by itself.

In very large orders, or those where the different members have not a very strong affinity for each other, the order is broken up into sections, which are called TRIBES. These also are sometimes divided again into SUB-TRIBES. When, however, these distinctions are important, and are nearly sufficient to constitute orders, the divisions are called SUB-ORDERS.

By a still further extension of the same principles, orders are grouped into CLASSES; and these generalizations might be carried even further, if necessary. Classes are also divided into SUB-CLASSES, under the same conditions as before.

The distinctions between the classes of the Natural System are so obvious, and so important, the principles upon which they are founded are so simple, and the

classes themselves are so few, that it is easy to give a sufficiently clear and precise explanation of them in a very small space, so that the learner may comprehend them, and thus soon be able practically to distinguish between them, and refer any of the plants of his acquaintance to their proper position. But the distinctions upon which orders are founded are so numerous, and so complex, requiring the consideration of so many particulars and circumstances, that I reserve them for future consideration, so as to be able to give a general and comprehensive review of the Vegetable Kingdom in the shortest possible compass. The same remark applies still more directly to the genera and species, which in almost any possible district are so numerous, that they are always reserved for a separate department called a Flora. Accordingly I restrict myself here to a view of the principal divisions merely of the Natural System.

The entire Vegetable Kingdom is divided into two great series, the Phænogamous, or Flowering plants, and the Cryptogamous, or Flowerless plants. The leading distinctions have already been explained; but it may be well to recapitulate them. The first series is distinguished by the possession of *proper flowers*, *i. e.* those with stamens, or pistils, or both. They produce *ovules*, or undeveloped seeds, which, when fertilized by the pollen, become *proper seeds*, possessing within themselves an embryo or undeveloped plant, destined by germination to become the future vegetable.

In Cryptogamous plants, on the contrary, we find neither proper stamens nor pistils, nor, in fact, any organs, so far as we can discover, performing their offices. They produce no ovules, which fertilized by pollen become seeds, containing the future plants in embryo; but they reproduce themselves by minute reproductive cells called *spores*, which, by cell-growth, develop the new plant. This last series are all herbaceous in our climate, and include the Scouring Rushes, Club-mosses, Ferns, Mosses, Liverworts, Lichens, Fungi, Seaweeds, and a few unimportant aquatic plants; while the Phænogamous plants, a very much larger list, include all others.

Phænogamous plants are again divided into the two classes of Exogens and Endogens. The principal distinctions upon which this classification is founded have already been explained, but, as before, for the sake of completeness, I will recapitulate briefly. They are distinguished mainly by differences in the mode of growth. These differences are most clearly defined in the woody stems of the two classes. Exogenous trees possess a stem readily distinguishable into bark, wood, and pith.

All growth takes place between the bark and wood, by the addition of layers to each. In herbaceous species, though the wood is absent, the distinction between the bark and pith still remains. The leaves, when present, are distinguished by their branching veins, and are hence called net, or feather-veined leaves. Their seeds have always two opposite cotyledons, except in the Pine family, which have several. The parts of their flowers are not usually multiples of three, but of some other number. When they have two series of floral envelopes, the calyx and corolla are usually distinguished by differences of color and appearance.

Endogens, on the contrary, possess a stem not distinguishable into bark, wood, and pith, but their structure is homogeneous. The woody stems of this class are composed of bundles of woody fibre disposed without order. The stem is surrounded by an integument which does not increase by layers, like bark. All additions to the woody structure take place in the *inside*. The herbaceous stems of this class consist chiefly of cellular tissue, surrounded by a mere cuticle. The leaves also usually present a remarkable difference from those of Exogens in their parallel veins, which run the whole length of the leaf unbroken. A few Endogens, however, have net-veined leaves. The flowers usually have their parts in threes, or multiples of three. The floral envelopes also are rarely distinguishable into calyx and corolla. The seeds are distinguished by having but one cotyledon, or sometimes two, which are alternate.

Such are the principal technical distinctions between these two classes; but even the herbaceous species present a remarkable difference in their general appearance, which will soon become a sufficient guide to the student, in nearly all cases. The Lily and Orchis tribes, and the Grasses, are our best examples of Endogens, as the Palms, and other arborescent species, are confined to tropical countries. All our forest trees, our shrubs, and the great majority of our most common herbaceous plants, such as the Pea and Bean tribe, and the Umbelliferous family, are examples of Exogens.

Exogens are again divided into two sub-classes ANGIOSPERMS (*covered seeds*), and GYMNOSEPERMS (*naked seeds*), on account of some important differences in their reproductive organs, which, in the latter, make a distant approach to the simplicity of the Ferns and Club-mosses. In these plants the staminate flowers are reduced to mere clusters of stamens, while the ovules, instead of being included in a regular ovary, are borne on the open surface or margin of a carpellary leaf, which takes the place of a pistil, and in the Pine family becomes a har-

dened scale. This sub-class includes only the Cone-bearing trees, and a small tropical family. The other division; Angiosperms, which have regular pistils with the ovules contained in a proper ovary, comprehends the rest of the Exogens.

This sub-class which still includes the great majority of flowering plants, on account of its size, is broken up, for the sake of greater convenience, into three nearly artificial sections.

Those of polypetalous corollas, form the section POLYPETALÆ; those with monopetalous corollas are included under MONOPETALÆ, while those destitute of a corolla constitute the section APETALÆ. As these, however, are artificial distinctions, there are in each section plants, which, so far as the corolla is concerned, would belong to other sections, but whose affinities compel us to place them where they are.

Having now considered the principal divisions of Flowering plants, those of Flowerless plants next claim our attention. Cryptogamous plants are divided into three great classes—Acrogens, Anophytes, and Thallophytes, depending upon distinctions in the mode of growth.

THE ACROGENS are those which have a regular axis of growth, like flowering plants. They have also the distinctions of stem, root, and foliage. Their stems consist of woody fibre and ducts, mingled with cellular tissue. In their general structure, they are not much inferior to many Phænogamous plants, except in their reproductive organs. Their sporangia, or spore-cases, and their spores, bear but a very distant resemblance to the flowers and seeds of Flowering plants. They are called ACROGENS (*plants growing at top*), because the axis grows only at the summit, and never increases in diameter. To this class belong the Scouring Rushes, Club-mosses, and Ferns.

THE ANOPHYTES (*plants growing upwards*), generally preserve the distinctions of root, stem, and leaves; and their reproductive apparatus still bears a remote resemblance to that of flowering plants. The stem grows upwards, and the root downwards; but their whole structure is composed solely of cellular tissue, except in a very few species which have ducts, and hence they are restricted to very low and humble forms, never exceeding a few inches in height. The Mosses and Liverworts are the chief examples of this class.

But when we reach THALLOPHYTES, all distinction between root, stem, and leaves, ceases; there is no longer any axis of growth, nor are there any organs corresponding to the reproductive apparatus of higher types. These

plants often assume the form of a flat expansion (*thallus*), whence they derive their name of *Thallophytes*, or *plants growing in flat masses*. Lichens, Fungi, and Sea-weeds, constitute this last, and lowest class of vegetation.

NOMENCLATURE.

You have seen that every plant is a species of some Genus, and that this genus is again included under some Order. These orders, genera and species, have Latin names. The names of the Orders are Latin adjectives, mostly derived from some prominent genus in the order, and usually ending in *aceae*, the noun *plante* being understood, as *Rosaceae*, derived from *Rosa*, and meaning *plants of the Rose tribe*. Sometimes they have names which were given before the Natural System was adopted, and have been retained on account of their significance, such as *Leguminosae*, plants with a pod, and *Coniferae*, Cone-bearing trees.

The names of the Genera are Latin nouns. These are sometimes the ancient names, as *Viola*, the Violet, *Urtica*, the Nettle. They are often formed arbitrarily from Latin, or more frequently from Greek words, to denote some quality of the plant, or some peculiarity of its structure, as *Liriodendron* (*Lily-tree*), derived from two Greek words, signifying respectively, *Lily* and *Tree*. They are also formed from the names of some distinguished Botanist, or patron of Botany, as *Linnaea*, from *Linnaeus*, *Magnolia*, from *Magnol*.

The Species are designated by Latin adjectives, or substantives used as adjectives, which are placed after the generic name; and the two together form what is called the Botanical name. These adjectives generally denote some quality, or peculiarity of the plant, or sometimes its native district, as *Rosa alba*, the White Rose, *Quercus tinctoria*, the Oak used in dyeing, *Corvus Canadensis*, a *Corvus* native in Canada. The specific name is also often derived from the name of a person. If the person was the discoverer of the species, the specific name is in the genitive singular, as *Diosmodium Dillenii*, a *Diosmodium* discovered by *Dillenius*; otherwise it is an adjective ending in *nus*, *na*, or *num*, according to the gender, as the *Carex Deweyana*, a *Carex* named in honor of Prof. Dewey.

The names of Classes, Orders, and Genera, always begin with capitals, being proper names, and also all specific names derived from persons, or places, or from nouns used as adjectives, as *Daucus Carota*, where the specific name is a noun.

In order that those unacquainted with Latin may find no difficulty in pronunciation, all words of three or more syllables are marked with an accent, thus, *Lupinus*, to denote the accented syllable. Words of but two syllables always have the accent on the first.

In all names derived from the Latin or Greek, that is, all but personal names, or names derived from some locality, the pronunciation of which is of course determined by the original word, every letter must always be pronounced, thus, in *Anémone*, the final *e*, so often silent in English, must be sounded. The final *a* must have the sound of *ah*, but less prolonged. Thus we pronounce *Malva Malva*, and not *Malvay*. *Ch* should always have the sound of *k*; and all the other letters have the same sound as in English.

BOTANICAL ANALYSIS.

The examination of a plant, in order to determine its class, order, and botanical name, is called *ANALYSIS*. A thorough knowledge of all these particulars is indispensable to a full understanding of the true nature and affinities of the various plants which come under our observation. The continual habit of analyzing plants gives us an acquaintance with their structure, their qualities and habits, more complete and thorough, than can be obtained by the most faithful study of books. I would, therefore, enjoin it upon the sincere student of the science, to seize every opportunity of studying the plants themselves, and thus add to his theoretical ideas the still more valuable practical knowledge.

In order that this object may be attained by the beginner, with the greatest possible ease and certainty, the descriptions of the Orders have an artificial analysis prefixed to them; and almost all the Orders have an artificial analysis of the Genera comprehended under them, the use of which will be explained. For the examination of minute flowers, or parts of a flower, a good magnifying glass is necessary.

In the choice of specimens for analysis, those in full bloom should always be preferred. Beginners will do well to select those flowers which have their parts pretty large and well defined, such as the *Rose* and *Lily*; but those which are rendered double by cultivation should always be avoided, for their essential organs (357) being changed to petals, it becomes extremely difficult to identify them. In getting specimens, it is best to examine and see if the flowers are perfect (374). If they are not, both the staminate and pistillate flowers should, if possible, be obtained.

Having procured a specimen, as of the Wild Rose, we proceed in our examination, finding that it has a proper flower, with proper stamens and pistils, and thus obviously belongs to *Phænogamous* plants. The stem being distinguished into pith, wood, and bark, would be sufficient to determine it to be an *Exogen*, which is further confirmed by the net-veined leaves (269), and the sepals and petals in fives, a number never found in *Endogens*. On all these grounds we may safely conclude that our plant is an *Exogen*. Examining still further, we find that the ovules are not arranged on the open surface or margin of a scale, and therefore conclude that the plant belongs to *Angiosperms*. This, also, is confirmed by the fact that the Cone-bearing trees, to which the *Rose* does not belong, alone constitute the sub-class, *Gymnosperms*.

Having thus ascertained that our plant belongs to the class *Exogens*, and the sub-class *Angiosperms*, we turn to the description of the Orders to determine its place there. The parts of the corolla are distinct; but we are not yet certain that it belongs to *Polypetalae*, for there are polypetalous plants in both the other sections. Referring to the *Polypetalous* plants not included under that section, we commence examining the list. The first order, *Ericaceae*, has the "leaves alternate, simple"—which disagrees; for the leaves of the *Rose*, though altern

ate, are pinnate. "*Aquifoliaceae*. Shrubs, petals 5," agrees. But the petals of the *Rose* not being linear, we pass to *Plumbaginaceae*. "*Acaulescent herbs*," disagrees. We, therefore, pass to *Oleaceae*. But as "*Stamens 2*" disagrees, we proceed to the next. But as the *Rose* is neither an evergreen shrub, nor monoclous, it cannot belong here; and, therefore, not being included in this exceptional list, we know that it belongs to *Polypetalae* proper. Passing to this section, we commence examining the Synopsis at the beginning, in order to find its proper group. The description of Group 1—"Leaves flat, alternate; Sepals distinct, and corolla regular," agrees; but "*Stamens inserted on the receptacle*," disagrees; for, on examination, we find the stamens inserted on the calyx. We, therefore, pass to Group 2, but as these are all *herbs*, and the *Rose* is a *shrub*, we go to the third, with which it disagrees, for the same reason. The fourth group consists of "*Herbs; or Shrubs with yellow flowers*." The Wild Rose is a shrub, but its flowers are not yellow; therefore we proceed to Group 5. "This group has the 'leaves alternate,' which agrees, and '20 or more stamens not inserted on the calyx,' which disagrees. The sixth Group includes only *Herbs*, or *Suffrutescent* plants, therefore the *Rose* cannot belong here. Group 7—"Trees, shrubs, or woody vines," agrees. But stamens 10 or less," disagrees; and we pass to Group 8. Again the character, "*Stamens 10 or less*," disagrees; therefore we proceed to Group 9, where the character given is, "*Leaves present, not fleshy; stamens more than 10*." The *Rose* agrees in all these points, and hence belongs to the ninth Group. Turning then to that Group in the descriptions of the Orders, we commence examining the characters of the Orders, till we find one with which our plant agrees. In this case it will be *Rosaceae*. We then turn to *Rosaceae* in the Flora, and examine the Synopsis of the genera, to find the genus.

Sub-order 1.—*Amygdaleae* has the "calyx free from the ovaries." This agrees; for what appear to be bony seeds, are, in reality, ovaries connected each with a single pistil. "*Style 1*." This disagrees; for there are many styles in the *Rose*. Therefore we pass to the second Sub-order, *Rosaceae* proper, the description of which agrees perfectly; for the calyx is free from the ovaries, the styles are many, the fruit consists of achenia, and the plant is a shrub.

We now go to the first Section, designated by a *. "*Fruit follicular*." This disagrees; and we pass on to the second Section, designated by **. "*Fruit consisting of achenia, not enclosed in the calyx tube*," disagrees; for the achenia are enclosed in the calyx tube. This forms the character of the third Section, marked by ***, to which we now pass, consequently our plant belongs here. The first genus, *Agriemolia*, consists of *herbs* with a dry turbinate calyx tube, covered with hooked bristles. But the *Rose* is a *shrub* with a fleshy calyx tube, either smooth or covered with straight bristles; therefore it cannot belong here. Comparing it with the character of the next genus, *Rosa*, we find a perfect agreement; for it has the calyx tube fleshy in fruit, the achenia bony, and is a prickly shrub.

We turn to the genus *Rosa*, and after examining the generic character, in order to become more familiar with it, we commence reading the descriptions of the species, until we find one with which our plant entirely agrees.

Such is the mode of analysis adopted in this work. But when we *already know* the order to which a plant belongs, we have only, by the same process described above, to trace out its genus and species.

If the plant is an *Endogen*, we can go to the Synopsis at once, and determine its group, and then its order; but if it be an *Exogen*, we must, in all cases, decide, in the manner illustrated above, whether it belongs to the section indicated by its corolla, before we consult the Synopsis. If we find that it agrees with the character of any order included under that list of exceptions, all we have to do is to turn to the proper order and find the genus as before. It should be stated here, that in all these analyses, Orders and Genera are sometimes divided; and in this case, any character given does not necessarily apply to all the plants belonging to the order or genus, but only to those under consideration. Thus the character given to some of the *apetalous* genera in *Ranunculaceae*, may not apply to all the *polypetalous* genera.

In determining whether a flower be monopetalous or not, you must not consider it polypetalous because the segments appear distinct; but you must pull them off, and see if they are not connected at the base.

There are a few tribes of plants which differ so much from the usual forms, that it seems best to explain their structure here, that the beginner may find no difficulty in their analysis. Thus if we take the flower of a *Dandelion*, not being acquainted with its peculiar structure, we might naturally suppose it polypetalous; but it really consists of a large collection of little flowers, each of them having its own monopetalous corolla, which, in the present case, takes the form of a strap. If we examine one of these little florets carefully, we can see that it has all the parts of a flower, as perfectly developed as any other. On the outside it has a ring of hairs, or *pappus*, which represents the calyx. Then comes the strap-shaped corolla; and from its tubular base arise the stamens, five in number, united by their anthers, and forming a hollow tube, through which the style projects.

In the *Thistle*, again, the same structure exists, except that the corolla takes the form of a tube, five-parted at the top. In the *Ox-eyed Daisy*, so common in pastures, these two forms are combined. The central portion of the flower is tubular, while on the outside we have a row of strap-shaped florets. In this form, the head of flowers at the first glance bear a strong resemblance to the flower of a polypetalous plant, the outer border of ligulate florets representing the corolla, and the central tubular flowers the stamens and pistils. The beginner should, therefore, remember that all flowers formed after the model of the *Dandelion*, the *Thistle*, or the *Daisy*, are not polypetalous, but really collections of monopetalous flowers.

The *Milkweed* family, also, have a curious structure. The calyx and deeply 5-parted corolla are reflexed, and 5 exserted processes, called collectively the crown, form the most showy portion of the flower. After removing this crown we come to the stamens, which are five, and united by their filaments into a tube, enclosing the pistil. Each anther is two-celled, each cell containing a mass of coherent pollen. The two nearest pollen-masses in the cells of two adjacent anthers, are connected together by a thread, and attached by it to one of the five glandular angles of the stigma. Soon, generally through the agency of insects, the pollen-masses are detached from the cells, and hang in pairs from the stigma, as in fig. 19, Plate XXV. A similar structure is found in the *Orchidaceae*, or *Orchis* family, except that the 3 stamens are consolidated with the pistil into a single column, and only one or two of the anthers are present and fertile. The structure of both the pollen-masses in most of their species, and the mode of their attachment to the stigma, is nearly the same.

PRESERVATION OF SPECIMENS.

It is usual for Botanists to preserve dried specimens of all the plants of their acquaintance, for the sake of having them to refer to at their leisure. A good specimen of the smaller herbaceous plants comprehends the whole, including the root. But in case of large herbs, or trees, such a portion of the stem is taken as will sufficiently represent the leaves, flowers, and fruit. When, however, the fruits or seeds are too large to be pressed, they should be preserved separately, together with pieces of the wood of arborescent species.

The next object is to extract the moisture. This is done by laying them in sheets of soft bibulous paper, with six or eight thicknesses of the same, interposed between. Then lay the pile between two perfectly level boards, and subject them to a strong pressure, yet not sufficient to crush their parts. Every

day all the sheets, excepting those containing the plants, should be changed, and their place supplied by others, fresh and dry. In a few days, varying with the nature of the plants, they will be ready to remove from the press.

These specimens, thus prepared, are attached by white glue each one either to a separate sheet, or a half sheet, of fine white firm paper. The Botanical name, locality, and any circumstance you may wish to preserve, are written on the corner. The sheets are now to be arranged according to their genera and species. They may be collected in folios, or lie flat, preserved on the shelves of a cabinet; but in all cases they must be kept in a perfectly dry place. Some odorous substance, such as camphor-gum, or musk, should be placed among them, to preserve them from insects. Such a collection is usually termed an *HERBARIUM*.

ORDERS OF THE NATURAL SYSTEM.

SERIES I.—*PHÆNOGAMIA*.

Plants with a regular axis of growth, usually furnished with proper leaves and real flowers, which contain proper stamens, or pistils, or both, and produce real seeds containing an embryo, destined, by germination, to become a future plant.

CLASS I.—*EXOGENÆ*.

Plants whose stems are more or less capable of being distinguished into an external bark, a central pith, and an intervening portion which in perennial stems is woody, and is increased by annual layers next the bark, which also increases by annual layers on the inside. Leaves net-veined. Flowers, when symmetrical, with their parts in fives or fours, rarely in threes. Seeds with two or more opposite, or verticillate cotyledons.

SUB-CLASS I.—*ANGIOSPERMÆ*.

Ovules inclosed in a proper ovary, and fertilized by the pollen through a proper stigma. Cotyledons two.

SECTION I.—*POLYPETALÆ*.

Flowers with at least two series of floral envelopes, and the corolla consisting of several distinct petals.

Polypetalous Plants not included under Polypetalæ.

Order LXVIII.—*Ericacæ*. Leaves, when present, alternate, simple. Flowers perfect. Petals equal, 4 or 5. Stamens 8 or 10, distinct. Style 1. Shrubs; or else acaulescent, or leafless herbs.

Order LXIX.—*Aquifoliacæ*. Shrubs. Petals 5, linear. Stamens 5, distinct. Stigmas 3 or 4.

Order LXXIV.—*Plumbaginacæ*. Acaulescent herbs. Stamens 5. Styles 5.

Order XCI.—*Oleacæ*. Shrubs. Stamens 2. Petals 4, linear.

Order CVII.—*Euphorbiacæ*. Evergreen shrubs, with monœcious flowers.

Order CIX.—*Juglandacæ*. Trees with monœcious flowers; the barren flowers in aments.

Polypetalæ proper.

Group 1.—Leaves flat, in aquatic species much dissected, alternate, or all radical, rarely opposite or verticillate. Sepals distinct, 3 or more. Corolla regular or irregular. Stamens inserted on the receptacle, distinct, more than 10; or else 6 or 8, and opposite the 6 or 8 equal petals. Ovaries simple, numerous, or few, rarely single. Orders I.—V. inclusive.

Group 2.—Herbs with alternate, or radical leaves. Flowers

perfect. Corolla regular. Petals never 5, except in plants with tubular leaves. Stamens 18, or more, inserted on the receptacle, distinct. Orders VI.—X. inclusive.

Group 3.—Herbs with alternate, or radical, not succulent, leaves. Flowers perfect. Sepals nearly or quite distinct, and regular; not spurred. Petals 4 or 5, not fugacious, sometimes cohering in pairs. Stamens inserted on the receptacle; when more than 6, always distinct. Ovary free from the calyx, or adherent only at base; becoming in fruit a 1 or 2-celled capsule, or pod. Orders XI.—XVI. inclusive.

Group 4.—Herbs; or yellow-flowered shrubs. Leaves simple. Flowers perfect. Corolla regular. Stamens not monadelphous; never inserted on the calyx, except when the petals are in several rows. Styles fewer than the stamens; or else both are 2 or 3 in number. Orders XVII.—XXII. inclusive.

Group 5.—Leaves alternate. Stamens 20 or more, not inserted on the calyx. Orders XXIII.—XXVI. inclusive.

Group 6.—Herbs; sometimes suffruticose. Flowers perfect. Stamens not inserted on the calyx. Fruit of 3—5 carpels, or a 3-5-celled capsule. Orders XXVII.—XXXIII. inclusive.

Group 7.—Trees, shrubs, or woody vines. Stamens 10 or less; distinct. Ovary free from the calyx, or adhering only at the base. Fruit never a legume. Orders XXXIV.—XLI. inclusive.

Group 8.—Flowers more or less irregular; rarely regular, and the fruit a legume. Stamens 10 or less. Orders XLII. and XLIII.

Group 9.—Leaves alternate or opposite; not fleshy. Stamens more than 10; distinct; inserted on the calyx. Orders XLIV.—XLVI. inclusive.

Group 10.—Flowers perfect. Stamens distinct, inserted on the calyx. Style 1, sometimes 2-cleft. Orders XLVII.—LI. inclusive.

Group 11.—Flowers monœcious, polygamous, or perfect. Stamens united in 1 or more sets; or else distinct, and inserted on the calyx. Orders LII.—LVI. inclusive.

Group 12.—Stamens 4 or 5, inserted upon the disk, which crowns the ovary. Calyx-tube adherent to the ovary. Orders LVII.—LIX. inclusive.

GROUP I.

ORDER I.—*Ranunculacæ*.

Herbs sometimes climbing, with a colorless acrid juice. Leaves mostly alternate, and much divided. Petioles usually sheathing at base. Sepals 3—6, usually 5, hypogynous, mostly deciduous. Petals 3—15, mostly 5, rarely united, or wanting. Stamens indefinite, hypogynous, distinct. Ovaries indefinite, rarely few, or solitary. Embryo minute, at the base of the horny or fleshy albumen.

A large order of plants, distinguished by their acrid, and usually poisonous juice. They generally grow in wet or damp situations. This order includes a great many ornamental cultivated plants. The *Ranunculus* (*Butter-cup*), fig. 1, the *Clematis* (*Virgin's-bower*), and *Anemone*, are examples. The *Delphinium* (*Lark-spur*), and *Aconitum* (*Monk's-hood*), are distinguished by very irregular flowers.

ORDER II.—Magnoliaceæ.

Trees or shrubs. Leaves alternate, single, entire, or lobed; never serrate, coriaceous; usually punctate with transparent dots. Stipules membranaceous, caducous, enveloping the bud. Flowers solitary, large and showy, usually fragrant. Sepals 3—6, deciduous, colored. Petals 3, or more; often in several rows. Stamens indefinite, hypogynous, distinct. Filaments short. Anthers adnate. Ovaries numerous, arranged in several rows on the elongated receptacle, forming a kind of cone. Seeds 1—2 in each carpel, from which, when mature, they are often suspended by a slender funiculus. Embryo minute, at the base of the fleshy albumen.

A noble order, consisting chiefly of large trees, native mostly at the South and West. The bark often contains an intensely bitter principle, which is tonic and stimulant. Examples are the *Magnolias* and the *Liriodendron*, or *Tulip-tree*, fig. 2.



Fig. 2.

ORDER III.—Anonaceæ.

Trees, or shrubs. Leaves alternate, entire. Stipules none. Sepals 3. Petals 6, in two series, of a dull color. Stamens indefinite, hypogynous, with short filaments and extrorse anthers. Ovaries usually numerous, closely packed together, sometimes cohering in a pulpy mass. Style short, or none. Stigmas simple. Carpels 1-seeded. Seeds anatropous.

A chiefly tropical order, represented in the United States by several species of *Asimina* (*Papaw*), and the delicious Custard-apples of the East and West Indies, also belong here.

ORDER IV.—Menispermaceæ.

Climbing, or twining, usually more or less shrubby plants. Leaves alternate, entire. Stipules none. Flowers small, arranged in panicles, or racemes, usually diœcious, but never perfect. Sepals 4—12 in 1—3 rows; deciduous. Petals 1—8; usually as many as the sepals; hypogynous, rarely wanting, or united. Stamens opposite the petals, and equalling them in number, or else 2—4 times as many. Anthers often 4-celled. Ovaries



Fig. 1.

usually several, when in flower, but in fruit mostly reduced to 1 or 2. Fruit, a berry, or drupe. Embryo large, curved, included in the fleshy albumen.

A small order, mostly tropical. The roots usually possess bitter and tonic properties. The *Monispermum* (*Moonseed*), one species of which yields *Columbo*, and the *Anamirta Cocculus*, the *Cocculus Indicus* of the shops, whose narcotic fruit is extensively used in adulterating malt liquors, are good examples.

ORDER V.—Berberidaceæ.

Herbs, or shrubs. Leaves alternate, simple, or compound, mostly exstipulate. Flowers perfect. Sepals 3—6, arranged in 1 or 2 rows. Petals as many as the sepals, and opposite them; or else twice as many. Stamens definite, as many as the petals, and opposite them; or else twice as many. Anthers extrorse, usually opening by recurved valves, as in fig. 5, Plate XXV. Ovary consisting of a single carpel, forming in fruit a 1-celled berry, or capsule. Seeds few; rarely many.

The *Berberis* (*Burberry*), and *Podophyllum* (*May-apple*), are familiar examples.

GROUP II.

ORDER VI.—Cabombaceæ.

Aquatic herbs. Leaves floating, entire, centrally peltate. Flowers small, solitary. Sepals 3—4, colored inside, persistent. Petals 3—4, alternate with them, persistent. Stamens hypogynous, 6—36. Anthers innate. Carpels 2—18, indehiscent. Seeds pendulous, globular.

A very small aquatic order, a good example of which is seen in the *Brasenia*, or *Water-shield*.

ORDER VII.—Nelumbiaceæ.

Aquatic herbs, with a somewhat milky juice. Leaves radical, very large, orbicular, peltate. Flowers large, solitary, on long scapes. Sepals 4—5, deciduous. Petals numerous, in many rows, arising from the base of the ob-conical disk. Stamens indefinite, in several rows, with petaloid filaments, and adnate anthers. Carpels several, separately immersed in hollows of the large, flat-topped torus. Seeds destitute of albumen. Embryo very large, with a highly developed plumule.

A very showy order, consisting of the genus *Nelumbium*, the two species of which are native, one of Asia, and the other of the United States.

ORDER VIII.—Nymphæaceæ.

Aquatic herbs. Leaves peltate, or cordate, arising from a creeping rhizoma. Flowers large, showy, often fragrant. Sepals and petals several, or numerous, imbricated in several rows, and passing into each other, persistent; the latter inserted in the fleshy disk, which surrounds the ovary. Stamens numerous, in several rows, with adnate and introrse anthers, and many of the filaments petaloid. Ovary many-celled, many-seeded, crowned by the radiate stigma, indehiscent. Seeds attached to the spongy placenta, anatropous.

The beautiful and fragrant *Nymphaea* (*White Pond-Lily*), the not less curious *Nuphar* (*Yellow Pond-Lily*), the celebrated *Lotus* of Egypt, fig. 4, Plate XXIX., and the splendid *Victoria* of South America, fig. 9, are fine examples.

ORDER IX.—Sarraceniaceæ.

Perennial, acaulescent herbs, growing in bogs. Leaves pitcher-shaped, as in fig. 9, Plate XVII. Flowers large, solitary, nodding. Sepals 5, persistent, with 3 bracts at base. Petals 5. Stamens indefinite, hypogynous. Anthers adnate, introrse. Style single. Stigma large, petaloid, persistent, covering the 5-celled, 5-valved ovary. Placentæ central. Seeds numerous, minute.

A small and very curious order, confined to the swamps of North America and Gulana, and illustrated by the *Sarracenia*, our common *Pitcher-plant*, as in fig. 2, Plate XVII.

ORDER X.—Papaveraceæ.

Herbs, usually with a milky or colored juice. Leaves alternate. Stipules none. Flowers solitary, on long peduncles, white, red, or yellow, but never blue. Sepals 2, rarely 3, caducous. Petals 4, rarely 6, regular, hypogynous. Stamens 8—24, or numerous, usually some multiple of 4. Anthers innate. Ovary single, 1-celled, forming a pod, with 2 or 3 parietal placentæ, or a capsule with several. Seeds numerous. Embryo minute, at the base of the copious, oily albumen.

A small but important order, chiefly natives of Europe, and distinguished not less by their narcotic properties, than by their splendid flowers. The most important product is Opium, derived from a species of *Papaver* (*Poppy*). Other examples are furnished by the *Sanguinaria* (*Blood-root*), and *Chelidonium* (*Celandine*).

GROUP III.

ORDER XI.—Fumariaceæ.

Smooth herbs, with a watery juice. Stems brittle. Leaves alternate, much divided, destitute of stipules. Flowers irregular. Sepals 2. Petals 4, in pairs, 1 or both of the outer ones spurred or sacate at base; the 2 inner cohering at apex. Stamens 6, diadelphous, with dilated, and more or less united filaments; the middle one of each set bearing a 2-celled anther; 2 outer ones 1-celled anthers. Ovary simple, becoming in fruit a 1-celled, 2-valved pod, or an indehiscent, persistent, globular capsule. Seeds with an aril. Embryo minute. Albumen fleshy.

A tribe of curious and often delicately beautiful, but otherwise unimportant plants. The *Fumaria* (*Fumitory*) and *Corydalis* are examples.

ORDER XII.—Cruciferae.

Herbs, rarely suffruticose. Leaves alternate. Stipules none. Flowers usually yellow or white, in racemes, or corymbs, desti-



Fig. 8.

tute of bracts. Sepals 4, deciduous. Corolla of 4 usually regular, unguiculate petals, spreading in the form of a cross, as in the Wall-

flower, fig. 18, Plate XXII. Stamens 6, 2 shorter than the other 4. Ovary consisting of 2 carpels united by a membranous partition, usually a 2-celled pod, called a Silique, as in fig. 14, Plate XXVII.; or a Silicle, as in fig. 3. Seeds destitute of albumen. Embryo variously folded, with the cotyledons on the radicle.

A large, important, and very natural order, containing some very beautiful and fragrant flowers, as the Wall-flower, Candy-tuft, and Stock-July-flower. The *Hesperis*, or *Rocket*, fig. 3, is a good example. The plants of this order are generally pervaded by an exceedingly acrid, but volatile principle, accompanied by an ethereal oil containing much sulphur, which gives them their well-known stimulant and antiscorbutic properties. This peculiar quality is especially developed in the *Sinapis* (*Mustard*), and the *Cochlearia* (*Horseradish*). In many of the cultivated species, the acrid principle is so far subdued, that they furnish valuable food to man and animals. Such are the Turnip, Cabbage, and Radish. None of the order, even the most acrid, are poisonous.

ORDER XIII.—Capparidaceæ.

Herbs; or, in the Tropics, shrubs or trees. Leaves alternate, destitute of true stipules. Flowers solitary, or in racemes. Sepals 4. Petals 4, cruciform, unguiculate, more or less unequal. Stamens 6—12, or numerous, usually some multiple of 4. Ovary composed of 2 united carpels. Styles united into 1. Fruit a 1-celled pod, without any partition; or baccate. Seeds usually many, reniform. Embryo curved, with foliaceous cotyledons.

An order much resembling Cruciferae, but usually distinguished by the number of its stamens, and always by the structure of its fruit. These plants are chiefly confined to the Tropics, where they are shrubs, or even trees. They are often still more acrid than Cruciferae; and their roots, bark, and herbage, are nauseously bitter, and sometimes poisonous.

ORDER XIV.—Resedaceæ.

Herbs, with a watery juice. Leaves alternate, without stipules, but often with 2 glands at base. Flowers small, often fragrant, in terminal racemes. Sepals 4—7, somewhat united at base, persistent. Petals 2—7, usually unequal and lacerated, with nectariferous claws. Stamens 8—40, rarely 3, inserted on the fleshy glandular disk. Ovary 1-celled, 3—6 lobed at summit, usually many-seeded, with 3—6 parietal placentæ, usually opening before maturity. Seeds reniform, with no albumen.

A small order, mostly natives of the Levant. It is well represented in the Mignonette (*Reseda odorata*), whose fragrant flower is a universal favorite.

ORDER XV.—Violaceæ.

Herbs; in the Tropics sometimes shrubby. Leaves alternate, or radical, petiolate, furnished with stipules. Flowers irregular, solitary. Sepals 5, persistent, slightly united, often auricled at base. Petals 5, usually unequal; the lower one usually large, and furnished with a spur at base. Stamens 5, inserted on the disk. Filaments broad, dilated, elongated beyond the anthers; 2 of them usually furnished with a spur-like process at base. Anthers adnate, introrse, 2-celled, approximate, or united in a ring. Ovary 1-celled, composed of 3 united carpels, with 3 parietal placentæ. Style usually declined, with a cucullate stigma. Fruit a 3-valved, usually many-seeded capsule. Seeds many, with a crustaceous episperm.

A beautiful order, of which the well known *Viola* (*Violet*), is the best example. Their roots have acrid and emetic properties. Some Brazilian species of *Ionidium* yield much of the Ipecac that is sold, though not the genuine article.

ORDER XVI.—Droseraceæ.

Herbs, usually covered with glandular hairs. Leaves alternate, furnished with a fringe of hairs, instead of stipules, at the base of the petiole, and circinate in veneration. Sepals 5, persistent, equal. Petals 5, alternate with the sepals, marcescent, convolute in prefloration. Stamens as many as the petals, and alternate with them, rarely 2—5 times as many, distinct, marcescent. Anthers extrorse. Ovary single, consisting of 2—5 united carpels. Styles 2—5, nearly or quite distinct, 2—many parted, sometimes all united into 1. Capsule 1-celled, 2—5 valved, with

loculicidal dehiscence, and 2—5 parietal placentæ. Seeds usually many. Embryo small.

A small order of marsh plants, of which *Drosera*, or the *Sun-dew*, is an example. To this order the following suborder is usually appended:—

SUB-ORDER.—PARNASSIÆ. Plants without glandular hairs, the petals imbricate in prefloration, and furnished with 5 appendages opposite each petal, consisting of several sterile stamens united together. Stamens somewhat perigynous. Anthers introrse. Stigmas placed opposite the 4 parietal placentæ. Seeds destitute of albumen.

A beautiful example is seen in *Parnassia*, *Grass of Parnassus*.

GROUP IV.

ORDER XVII.—Cistaceæ.

Herbs, or low shrubs. Leaves simple, the lowest commonly opposite; the rest usually alternate. Flowers perfect, yellow, sometimes white, or red. Sepals mostly 5, the 3 inner convolute in prefloration, the 2 outer minute, or wanting. Petals 5, rarely 3, regular, in prefloration usually convolute in a direction contrary to that of the sepals. Stamens indefinite, sometimes few, hypogynous, distinct. Anthers innate. Ovary of 3—5 united carpels. Style 1. Fruit a 1-celled, or imperfectly 3—5-celled capsule. Seeds few, or numerous.

A small and unimportant order, distinguished by the very showy flowers of some of the species. The most common examples are *Hellanthemum* (*Rock Rose*), or *Ice Plant*, and *Lechea* (*Pin Weed*).

ORDER XVIII.—Hypericaceæ.

Herbs, or shrubs. Leaves opposite, entire, without stipules, usually punctate with black glands and transparent dots. Flowers mostly regular. Sepals 4—5, distinct, or united at base, persistent. Petals as many as the sepals, and alternate with them, twisted in prefloration. Stamens hypogynous, usually numerous, and cohering by their filaments in 3, or more sets; sometimes definite, and monadelphous, or distinct. Anthers versatile. Ovary composed of 2—5 united carpels. Styles 2—5, distinct, or partially united. Fruit a many-seeded capsule, with septicidal dehiscence, either 1-celled, or more or less completely 2—5-celled.

A small order of unimportant plants. The *Hypericum* (*St John's Wort*), is a good example.

ORDER XIX.—Elatinaceæ.

Annual herbs. Leaves opposite, with minute, membranaceous stipules. Flowers minute, axillary. Sepals 2—5, mostly distinct, persistent. Petals as many as the sepals, and alternate with them. Stamens as many, or twice as many as the petals. Ovary 2—5-celled. Styles, or stigmas, 2—5. Capsule 2—5-celled, 2—5-valved, many-seeded, crowned by the persistent stigmas.

A very small order of unimportant marsh plants, of which our only example is a species of *Elatine*.

ORDER XX.—Caryophyllaceæ.

Herbs. Stems with tumid nodes. Leaves opposite, entire, sometimes verticillate. Flowers regular. Sepals 4, or 5, sometimes coherent in a tube. Petals 4 or 5, or none. Stamens as many, or twice as many as the petals, rarely only 2 or 3. Ovary mostly 1-celled. Styles 2—5, stigmatose on the inner side. Fruit a 1-celled utricle, or more commonly a capsule, 2—5-valved, or opening at top by twice as many valves, or teeth, as there are stigmas.

A large order containing many beautiful plants, such as the *Dianthus* (*Pink*), fig. 4, and also many insignificant weeds, of which the *Stellaria* (*Chickweed*), and *Mollugo* (*Carpet-weed*), are examples.



Fig. 4.

ORDER XXI.—Portulacaceæ.

Herbs, more or less succulent, or fleshy. Leaves opposite, or alternate, entire, destitute of proper stipules. Flowers showy, opening only in the sunshine, solitary. Sepals 2, often cohering to the ovary at base. Petals 5, rarely more, ephemeral. Stamens variable in number, sometimes as many as the petals, and opposite them. Ovary 1-celled. Styles 2—8, stigmatose along the inner surface. Fruit opening transversely, forming a pyxis, fig. 7, Plate XXVII; or else a loculicidal capsule, with as many valves as there are stigmas. Seeds numerous, or few.

A small order of unimportant plants, including, however, many with showy flowers. *Portulaca* (*Purslane*), and the *Claytonia* are examples.

ORDER XXII.—Mesembryanthemaceæ.

Succulent herbs. Leaves opposite, entire. Flowers showy, opening only in sunshine. Sepals 4—8, usually 5. Petals indefinite, colored, in many rows. Stamens indefinite, distinct. Ovary many-celled, many-seeded. Stigmas numerous. Capsule opening by many teeth, presenting a radiate appearance.

A curious, and often very ornamental tribe of fleshy plants, native chiefly of the Cape of Good Hope. The species of *Mesembryanthemum* (*Ice Plant*, *Fig Marigold*), are examples.

GROUP V.

ORDER XXIII.—Malvaceæ.

Herbs, or shrubs, sometimes trees. Leaves alternate, stipulate. Flowers regular, axillary, often with an involucre at the base of the calyx. Sepals 5, somewhat united. Petals as many as the sepals, alternate with them, hypogynous. Stamens numerous, monadelphous, hypogynous, united to the petals at base. Anthers uniform, 1-celled, bursting transversely. Pollen hispid. Ovary 1, several-celled; or ovaries several, arranged circularly round a common axis. Fruit a several-celled capsule, or consisting of several separate, or separable 1—2 seeded carpels.

A rather large order of plants usually with very showy flowers, and abounding in mucilage. Their most important product is Cotton, derived from two species of *Gossypium*, forming the hairy covering of the seed. Examples are *Malva*, the *Mallow*, and the *Hibiscus*.

ORDER XXIV.—Tiliaceæ.

Trees, or shrubby plants. Leaves alternate, stipulate, deciduous. Sepals 4—5, deciduous. Petals 4—5, with 4—5 glands

at base. Stamens usually indefinite, distinct, hypogynous. Ovary with 2—10 united carpels. Styles united into 1. Stigmas as many as the carpels. Fruit a 2—5-celled capsule, often by abortion 1-celled; 1—2-seeded.

A chiefly tropical order, represented in the North by the Linden, or Bass-wood (*Tilia*).

ORDER XXV.—Ternstroemiaceæ.

Trees, or shrubs. Leaves alternate, coriaceous, simple, without stipules. Flowers usually white, large, and showy. Sepals 3—7, coriaceous, deciduous. Petals 5—9, imbricated in prefloration. Stamens indefinite, hypogynous, united by their filaments into 1 or several sets. Ovary several-celled. Styles 3—7, more or less united. Fruit a 2—7-celled capsule. Seeds large, few in each cell.

An order of ornamental, chiefly tropical shrubs. The well-known Camellia belongs here, and also the Tea-shrub (*Thea*).

ORDER XXVI.—Aurantiaceæ.

Trees, or shrubs. Leaves alternate, either compound, or with jointed petioles. Stipules wanting. Flowers fragrant. Sepals united into an urceolate, or campanulate cup. Petals 3—5. Stamens equalling the petals in number, or some multiple of them, inserted in a single row upon a hypogynous disk, often united in 1, or several sets. Style 1. Fruit a large, globular, many-celled berry, covered with a thick leathery rind, and containing a pulp.

An order of Asiatic trees, distinguished by their juicy, aromatic, and often delicious fruits, as in the *Citrus*, a genus that contains the Orange, Lemon, and Citron.

GROUP VI.

ORDER XXVII.—Linaceæ.

Herbs, sometimes suffruticose. Leaves sessile, entire, alternate, or apparently opposite, destitute of stipules. Flowers regular, symmetrical. Sepals 3—5, distinct, or somewhat united at base. Petals as many as the sepals, and alternate with them, convolute in prefloration. Stamens as many as the petals, usually alternate, with 5 processes resembling teeth, and united with them in a hypogynous ring. Styles as many as the stamens. Ovaries of 3—5 united carpels. Stigmas capitate. Capsule globose, 3—5-celled, each cell more or less completely divided by a false dissepiment. Carpels 2-valved at apex, 2-seeded. Seeds without albumen.

A small order distinguished by the symmetry of its flowers. The principal genus is *Linum*, one species of which furnishes the important article, Flax.

ORDER XXVIII.—Geraniaceæ.

Herbs, sometimes somewhat suffruticose. Stems with tumid nodes. Leaves usually palmately veined, and lobed, the lower ones generally opposite. Sepals 5, persistent. Petals 5, unguiculate, sometimes unequal. Stamens 10, hypogynous, united by their broad filaments; 3 or 5 of them sometimes sterile. Ovary with 5 2-ovuled carpels. Styles attached to the base of a prolonged axis, to which the styles adhere. Fruit consisting of 5 1-seeded carpels, which at length separate from the axis by curving back from their base, remaining attached at summit by the persistent, hardened styles.

A very ornamental order, chiefly natives of the Cape of Good Hope. The roots are astringent, and sometimes used as medicine. Examples are the common Cranes-bill (*Geranium maculatum*), and the numerous species of *Pelargonium*, which constitute the great majority of plants cultivated, and known as Geraniums.

ORDER XXIX.—Oxalidaceæ.

Herbs, with an acrid juice. Leaves alternate, compound. Flowers perfect, regular. Sepals 5, persistent, distinct, or slightly coherent at base. Petals 5, equal, unguiculate, deciduous, spirally twisted in prefloration. Stamens 10, hypogynous, more or less monadelphous, those opposite the petals longest. Ovary

consisting of 5 united carpels, opposite the petals. Styles 5, distinct. Fruit a membranous, 5-lobed, 5-celled capsule, usually separable into the 5 carpels.

A small order of plants distinguished by their sour juice, which contains oxalic acid. The Oxalis (*Wood-sorrel*), is our only example.

ORDER XXX.—Balsaminaceæ.

Succulent herbs. Leaves simple, without stipules. Flowers very irregular. Sepals 5, deciduous, colored, the 2 upper, or interior ones, united; the lowest spurred, or gibbous. Petals 4, united by pairs. Stamens 5, hypogynous, cohering at apex. Filaments subulate. Anthers 2-celled. Capsule 5-celled, bursting elastically by the 5 valves. Seeds several in each cell.

A small and unimportant order of succulent plants, but affording many ornamental flowers. The genus *Impatiens* contains the Garden Balsamine, and two native species.

ORDER XXXI.—Tropæolaceæ.

Twining, or running herbs, with a pungent watery juice. Leaves peltate, or palmate. Flowers irregular. Calyx consisting of 5 colored, united sepals, the lowest spurred. Petals 5, the three lower stalked. Stamens 8, distinct, unequal. Ovary with 3 united carpels. Style 1. Fruit separating into 3 indehiscent, 1-seeded carpels. Seeds large, with large and thick cotyledons.

This order consists of a few South American plants. One species of *Tropæolum* (*Nasturtium*), is common in cultivation.

ORDER XXXII.—Limnanthaceæ.

Annual herbs, with a somewhat acrid juice. Leaves alternate, pinnatifid. Flowers regular. Sepals 3—5, united at base, persistent. Petals 3—5. Stamens twice as many as the petals, hypogynous. Ovary consisting of 2—5 distinct carpels, opposite the petals. Fruit of 2—5 somewhat fleshy achenia.

Marsh herbs, represented at the North by *Flörkia*.

ORDER XXXIII.—Rutaceæ.

Herbs, shrubs, or trees. Leaves punctate, without stipules. Flowers perfect. Sepals 4—5. Petals 4—5. Stamens as many, or twice as many as the petals, inserted on a hypogynous disk. Ovary 3—5-lobed, 3—5-celled. Styles united, or distinct only at base. Fruit usually separating into 3—5 few-seeded carpels.

A family of plants remarkable for their strong odor, and intense bitterness. The common Rue of the garden (*Ruta*), is a good example of this chiefly tropical order.

GROUP VII.

ORDER XXXIV.—Zanthoxylaceæ.

Trees, or shrubs. Leaves without stipules, punctate with pellucid dots, usually pinnate. Flowers regular, polygamous. Sepals 3—9, small, cohering at base. Petals as many as the sepals, or none. Stamens as many as the sepals, and alternate with them, rarely twice as many, in the pistillate flowers imperfect, or wanting. Ovaries as many as the sepals, rarely fewer, more or less stipitate, distinct, or united. Fruit sometimes baccate, or membranaceous, usually of 1—5 drupes, or 2-valved, 1—2-seeded capsules.

A small order of trees, mostly tropical, distinguished by the bitter and aromatic properties of their bark, of which *Zanthoxylum* (*Prickly-Ash*), is our only example.

ORDER XXXV.—Anacardiaceæ.

Trees, or shrubs, with a resinous, gummy, or milky, sometimes acrid juice. Leaves simple, or compound, alternate, not dotted, destitute of stipules. Flowers small, often polygamous, or dioecious. Sepals 5, rarely 3, united at base, persistent. Petals as many as the sepals, sometimes none. Stamens as many as the petals, alternate with them, inserted on the base of the calyx. Ovary 1-celled, nearly or quite free from the calyx. Ovule soli-

tary. Styles 3—5, distinct, or united. Fruit a drupe; or less commonly a bony, 1-seeded nut.

A chiefly tropical order of plants, distinguished by their resinous, often poisonous, juice, which frequently furnishes material for varnishes. The fruit, however, is generally harmless, or even edible and delicious, as the Mango and Cashew-nut. The *Khus* (*Sumach*), is the only native of the North.

ORDER XXXVI.—Aceraceæ.

Trees, or shrubs. Leaves opposite, without stipules, simple, and palmately lobed, or pinnate. Flowers often polygamous. Sepals 5, rarely 4—9, colored, more or less united. Petals as many as the sepals, or none. Stamens hypogynous, 3—12, usually 8, distinct. Ovary of 2 partly united carpels, forming a double samara in fruit. Ovules 2 in each cell. Seeds 1 in a cell.

An order containing many noble and useful trees, natives of the Northern Temperate Zone. Several species of the *Acer* (*Maple*), fig. 5, yield sugar; but none so abundantly as the Rock-Maple (*Acer Saccharinum*).



Fig. 5.

ORDER XXXVII.—Hippocastanaceæ.

Trees, or shrubs. Leaves opposite, destitute of stipules. Flowers showy, with articulated pedicels. Calyx campanulate, consisting of 5 united sepals. Petals 5, unequal, 1 sometimes wanting. Stamens 6—8, commonly 7, distinct, unequal, inserted on the disk together with the petals. Ovary consisting of 3 united carpels, 3-celled, with 2 ovules in each cell. Style 1, filiform. Fruit subglobose, coriaceous, with 1—3 large roundish seeds. Cotyledons thick and fleshy.

A small order of ornamental trees, with astringent bark, represented among us by the species of Horse-Chestnut (*Æsculus*), one of which has been introduced from Asia. Another is the true Buck-eye, and native of the West, especially Ohio.

ORDER XXXVIII.—Celastraceæ.

Shrubs, or trees. Leaves alternate, or opposite, simple. Sepals 4—5. Petals 4—5, inserted on the flat disk surrounding the ovary. Stamens as many as the petals, alternate with them, inserted on the margin of the disk. Ovary free from the calyx. Fruit a capsule, or berry, with 1—5, 1 few-seeded cells. Seeds usually arilled.

A small unimportant order, of which *Celastrus* (*False Bitter-sweet*), and *Euonymus* (*Burning-bush*), are examples.

ORDER XXXIX.—Rhamnaceæ.

Shrubs, or trees, often with spinose branches. Leaves simple, alternate, rarely opposite. Flowers small. Sepals 4—5, united at base, valvate in prefloration. Petals 4—5, inserted in the throat of the calyx, cucullate, or convolute, sometimes wanting. Stamens 4—5, inserted opposite the petals. Ovary of 2—4 united carpels, 2—4-celled, usually more or less free from the calyx, sometimes immersed in the fleshy disk surrounding it. Fruit a berry, or a capsule with dry and separable carpels. Seeds without an aril.

An order of shrubby plants, distinguished by the bitter and astringent qualities of the bark. *Rhamnus* (*Buck-thorn*), and *Ceanothus* (*Jersey-tea*), are examples. The berries of *Buck-thorn* are cathartic, and are used in medicine. They also yield the paint called Sap green. The genuine jujube-paste is derived from several species of *Zizyphus*, a genus of this order.

ORDER XL—Staphyleaceæ.

Shrubs. Leaves opposite, compound. Flowers regular. Sepals 5, colored, persistent. Petals 5, alternate with the sepals. Stamens 5, inserted in the disk surrounding the ovary. Styles 3, nearly, or quite distinct. Ovary of 3 carpels, becoming in fruit an inflated, 3-seeded, 3-celled capsule, 3-parted at apex. Seeds bony and nut-like, several in a cell.

A small order nearly allied to the last, of which *Staphylea* (*Bladder-nut*), is the principal genus.

ORDER XLI.—Vitaceæ.

Woody plants, climbing by tendrils. Leaves simple, or compound, often alternate. Flowers small, often polygamous, or dioecious. Calyx very small, entire, or with 4 or 5 teeth, lined by a disk. Petals 4 or 5, inserted on the margin of the disk, often cohering by their tips, and caducous. Stamens 4 or 5, opposite the petals, and inserted with them. Ovary 2-celled. Style short, or none. Fruit a globose, usually pulpy berry, often 1-celled, and 1 or few-seeded by abortion.

Vitis, the *Grape-vine*, is the most important plant of the order.

GROUP VIII.

ORDER XLII.—Polygalaceæ.

Herbs, or somewhat shrubby plants. Leaves usually alternate, sometimes verticillate, simple. Flowers perfect, irregular. Sepals 5, distinct, usually persistent, very irregular; 3 exterior and smaller; the 2 lateral, interior ones larger, and petaloid. Petals irregular, usually 3, the anterior one (*the keel*), larger than the others, and usually crested, or 3-lobed. Stamens 6—8, hypogynous. Filaments united into a tube, which is split on the upper side, and more or less coherent to the claws of the petals. Ovary compound, free from the calyx, consisting of 2 united carpels, sometimes 1-celled by the suppression of the upper cell. Style curved, often cucullate. Fruit opening in a loculicidal manner; or indehiscent.

The genus *Polygala*, one species of which is the well-known Seneca Snake-root, contains our only representatives of this family, which is generally distinguished by active properties, and by a bitter principle, that pervades the whole order.

ORDER XLIII.—Leguminosæ.

Herbs, shrubs, or trees. Leaves alternate, often compound. Stipules present, sometimes deciduous. Calyx consisting usually of 5, more or less united sepals. Petals 5, either papilionaceous, or regular. Stamens perigynous, sometimes hypogynous, diadelphous, monadelphous, or distinct. Ovary single, and simple. Fruit a legume, assuming various forms, sometimes divided into several 1-seeded joints, as in fig. 12, Plate XXVII., when it is called a loment; while the proper legume is seen in the Pea. Seeds solitary, or several, destitute of albumen. The order is divided into 3 sub-orders, Papilionaceæ, Cæsalpinieæ, and Mimoseæ. Papilionaceæ has papilionaceous flowers, 10 stamens, diadelphous, sometimes monadelphous, rarely distinct, inserted on the bottom of the calyx. The Pea, Bean, and Locust-tree are familiar examples. The peculiar structure of this sub-order, which

in our district is far more abundant than either of the others, is illustrated by the Sweet-Pea (*Lathyrus odoratus*), fig. 6, the Lentil (*Ervum Lens*), fig. 7, and the Running Bush-Clover (*Lespedeza procumbens*), fig. 8. The sub-order *Cesalpiniæ* has the corolla nearly or quite regular, and the stamens always distinct. The *Cassia* and the *Gleditschia* (*Three-thorned Locust*), are good illustrations. Sub-order *Mimosæ* contains a large and almost entirely tropical group, with regular calyx and corolla, and the stamens often hypogynous and indefinite. Examples are the *Acacia* and the *Mimosa*, or *Sensitive plant*.



Fig. 6.

wood of Egypt, the *Laburnum* and the *White-Locust*, yield beautiful or durable woods, for timber and ornamental purposes. The medicinal products are also particularly rich. *Senna* consists of the dried leaves of several Egyptian *Cassias*; *Licorice* is derived from the roots of *Glycyrrhiza glabra*, of Southern



Fig. 7.

Europe; *Gum-Arabic*, and *Gum-Senegal*, are products of different African species of *Acacia*; and *Gum-Tragacanth* of a Persian species of *Astragalus*. The *Balsams Copaiva*, *Tolu*, and *Pern*, are yielded by several tropical trees belonging here. This order also contributes largely to the materials of dyes, in the *Logwood*, *Brazilwood*, and the still more valuable *Indigo*.



Fig. 8.

GROUP IX.

ORDER XLIV.—Rosaceæ.

Trees, shrubs, or herbs. Leaves alternate, or radical. Stipules usually present. Flowers regular, usually perfect. Sepals 5, rarely less, more or less united, commonly persistent. Petals 5, perigynous, sometimes wanting. Stamens numerous, rarely few, inserted on the calyx, distinct. Ovaries several, or 1, often adherent to the calyx-tube, and to each other. Styles distinct, or united. Fruit a drupe, pome, achenium, or follicle.

A very important order of plants, native principally of the Northern Temperate Zone, distinguished especially by the great number of delicious fruits they afford. The *Apple*, *Cherry*, *Plum*, *Strawberry*, and *Raspberry*, are among the products of this order. Nor is it less rich in ornamental plants. The numerous species of *Rose* are familiar and beautiful examples. A native species, *Rosa lucida*, is seen fig. 9. The roots and bark of the whole order are



Fig. 9.

more or less astringent. The leaves of the *Peach* tribe contain hydrocyanic acid, in some species, in such quantities as to make them dangerous; and the leaves of one of them, a southern species of *Wild Cherry*, often destroy cattle that feed on them. The root of the *Water-Avon* is astringent, and is sometimes prepared as a substitute for chocolate, and that of *Gillenia* (*Indian Physic*), has emetic properties, and in small doses is tonic.

ORDER XLV.—Calycanthaceæ.

Shrubs, with square stems, and when old, 4 axes of growth. Leaves simple, opposite, entire, destitute of stipules. Flowers solitary, axillary. Sepals and petals colored, in several rows, passing into each other, united below in a fleshy tube, or cup. Stamens indefinite, inserted on the fleshy tube of the calyx, the inner row sterile. Ovaries several, each with a terminal style, all inclosed in the calyx-tube. Achenia 1-seeded.

A small order of aromatic plants, of which *Calycanthus* (*Carolina Allspice*), better known as the *Sweet-scented Shrub*, is an example.

ORDER XLVI.—Myrtaceæ.

Trees, and shrubs. Leaves opposite, punctate, entire, usually with a marginal vein. Calyx-limb 4–5 cleft, adherent below to the compound ovary. Petals 4, or 5, rarely more. Stamens indefinite, with long filaments, and introrse anthers. Style 1. Fruit many-seeded,

A large and chiefly tropical order, distinguished by dotted leaves, and aromatic properties. Myrtus, the *Myrtle*, and Punica, the *Pomegranate*, are examples of this family, which also includes the *Caryophyllus aromaticus*, or Clove-tree, and the *Eugenia Pimenta*, the dried fruit of which is known in cookery as Allspice.

GROUP X.

ORDER XLVII.—Melastomaceæ.

Trees, shrubs, or herbs, with square branches. Leaves opposite, ribbed, entire. Sepals 4—6, united, persistent, forming an urceolate tube, which coheres only with the angles of the ovary. Petals as many as the calyx-segments, twisted in prefloration. Stamens twice as many as the petals, rarely as many, the filaments inflexed in prefloration. Anthers 1-celled, before flowering contained in the cavities between the calyx and ovary. Fruit a capsule, and nearly free from the investing calyx; or else baccate.

A large tropical order, of which the different species of *Rhexia* (*Meadow Beauty*, *Deer Grass*), are our only representatives.

ORDER XLVIII.—Lythraceæ.

Herbs, rarely shrubs. Leaves opposite, or verticillate, rarely alternate, entire. Calyx tubular, 4—7-lobed, the lobes sometimes with intermediate teeth. Petals inserted between the calyx-segments, very deciduous, or none. Stamens as many as the petals, or 2—4 times as many, inserted on the calyx-tube. Ovary inclosed in the calyx-tube, but not adherent, 2—4-celled. Style 1. Capsule membranous, usually 1-celled by abortion. Seeds small, attached to a central placenta, destitute of albumen.

An unimportant, mostly tropical order, represented among us chiefly by the *Lythrum* and *Decodon*.

ORDER XLIX.—Onagraceæ.



Fig. 10.

Herbs, or shrubs. Flowers axillary, in spikes, or racemes. Sepals united in a tubular 2—6 lobed calyx. Petals usually as many as the calyx-lobes, and alternate with them, sometimes none. Stamens as many, or twice as many, inserted in the calyx-throat, 1—8. Filaments distinct. Ovary coherent with the calyx-tube, 2—4, or by abortion 1—2-celled. Style prolonged, or filiform. Fruit baccate, or capsular; sometimes dry and indehiscent.

A rather large order, abundant almost throughout America, comprehending some ornamental plants, but otherwise not very remarkable. The *Epilobium* (*Willow-herb*), and *Eriogonum* (*Evening Primrose*), fig. 10, are natives; and the beautiful *Fuchsia*, or *Lady's Eardrop*, is cultivated among us.

ORDER L.—Cactaceæ.

Succulent, shrubby plants, almost always destitute of leaves, and producing spinose buds. Stems usually angular, or flattened, or columnar. Flowers sessile, showy. Sepals numerous, forming a tube, which adheres to the ovary, completely inclosing it. Petals indefinite, often passing into the sepals, inserted into the calyx-tube over the summit of the ovary. Stamens indefinite, attached to the base of the petals, with long filaments and versa-

tile anthers. Ovary 1-celled, fleshy. Style single, forming a stellate, cluster with several anthers. Fruit a many-seeded berry.

A very remarkable order of shrubby plants, distinguished by their curious structure and splendid flowers. They are all American, and chiefly confined to the tropics. The fruit of several species is edible; the acid juice of others affords a cooling draught for the traveller, in those arid regions where they abound; the Torch Thistles, which grow to the height of 30 or 40 feet, supply the natives with wood; and several other species give food to the precious cochineal insect, which yields the beautiful red dye known by its name. The *Opuntia* (*Prickly Pear*) is found native as far north as Massachusetts; and several species of *Cereus* and *Melocactus*, are cultivated among us, under the common name of Cactus.

ORDER LI.—Grossulaceæ.

Shrubs, unarmed or prickly. Leaves alternate, palmately lobed, plaited in veneration. Flowers in axillary racemes. Calyx 5-leaf, regular, marcescent, the tube adherent to the ovary. Petals 5, inserted in the calyx-tube, alternate with its segments. Stamens 5, alternate with the petals, very short. Ovary 1-celled; with 2 parietal placentæ. Styles 2, distinct, or united. Fruit a berry, crowned by the withered flower.

An order containing merely the genus *Ribes*, of which all our Currants and Gooseberries are species.

GROUP XI.

ORDER LII.—Passifloraceæ.

Herbaceous or shrubby, usually climbing plants. Leaves alternate, with leafy stipules. Flowers large, showy, often with a 3-leaved involucre. Sepals 4—5, united below into a tube of varied length, the throat of which is usually lined with a ring of filamentous processes. Petals 4—5, sometimes irregular or wanting. Stamens 4—5, monadelphous, surrounding and adhering to the stalk of the free, 1-celled, stipitate ovary. Styles 3—4, clavate. Fruit naked, or else merely surrounded by the persistent calyx, sometimes dehiscent, sometimes fleshy and indehiscent, many-seeded.

A chiefly tropical order, producing some ornamental flowers, and sometimes edible fruits, as the *Grenadilla*, which is the fruit of a species of *Passiflora*, or *Passion-flower*. One species, the *Passiflora caerulea*, is common in cultivation.

ORDER LIII.—Cucurbitaceæ.

Succulent herbs, climbing, or creeping by tendrils. Leaves alternate, palmately lobed and veined, coarse and rough. Flowers monœcious, or polygamous. Calyx 5-lobed. Petals 5, united together, attached to the calyx, very cellular, and much reticulated in structure. Stamens 5, united in 1 or 3 sets, rarely 3, and diadelphous. Anthers very long, variously wavy and contorted, 2-celled. Ovary adherent to the calyx-tube, 1-celled, with 3 parietal placentæ. Fruit a pepo, rarely membranous, and 1—4 seeded. Seeds flat.

A very important, chiefly tropical order, which affords many nourishing and delicious fruits. They are, however, pervaded by a bitter cathartic principle, which is sometimes so active as to make them poisonous. The *Colocynthis* and *Elaeterium*, well known articles of the *Materia Medica*, are found here. The Pumpkin, Squash, Cucumber, Gourd, and Melon, are examples among our cultivated fruits.

ORDER LIV.—Crassulaceæ.

Succulent herbs, or shrubby plants. Leaves simple, without stipules. Flowers usually in cymes. Sepals 3—20, more or less united at base, persistent. Petals as many as the sepals, rarely cohering together, sometimes none. Stamens as many as the sepals, and alternate with them, or twice as many, inserted on the calyx. Ovaries as many as the petals, and opposite to them. Follicles as many as the ovaries, many-seeded.

An unimportant order of succulent plants, growing in dry and arid soils and districts. *Sedum* (*Orpine*, *Live-forever*) and *Sempervivum* (*Houseleek*), are examples.

ORDER LV.—Saxifragaceæ.

Herbs, or shrubs. Leaves alternate, or opposite, sometimes stipulate. Sepals 4 or 5, more or less cohering, persistent. Petals 4 or 5, inserted between the calyx lobes, rarely wanting.

Stamens 5—10, inserted on the calyx tube. Ovary adherent to the calyx tube, of 2, or sometimes 3—5 carpels, cohering below, distinct above. Styles 2, sometimes 3—5. Fruit 1, or rarely 3—5-celled capsule.

An unimportant order, native chiefly of the colder portions of the world, often ornamental in cultivation. *Saxifraga* (*Saxifrage*), *Hydrangea* and *Philadelphus* (*False Syringa*), are examples.

ORDER LVI.—Hamamelaceæ.

Shrubs. Leaves alternate, with veins running from the mid-vein to the margin. Stipules deciduous. Calyx 4-cleft. Petals 4, linear, sometimes none. Stamens 8, those opposite the petals barren, or else many, and all fertile; inserted on the calyx. Ovary 2-celled. Styles 2, distinct. Capsule coriaceous, or woody, 2-beaked, 2-celled, free from the calyx at apex.

A small and unimportant order, represented at the North by the Witch Hazel (*Hamamelis*), which, however, has some medicinal properties.

ORDER LVII.—Umbelliferae.

Herbs, rarely suffrutescent. Stems usually hollow and furrowed. Leaves alternate, usually more or less compound, the petioles becoming dilated, and sheathing at base. Flowers in umbels, usually with an involucre. Calyx adherent to the ovary, the very small border 5-toothed, or entire. Petals 5, usually with an inflexed point, inserted between the calyx-teeth in a disk which crowns the ovary. Stamens 5, alternate with the petals. Ovary of 2 united carpels, 2-celled, with 1 ovule in each cell. Styles 2, distinct, or united and thickened at the base. Fruit consisting of 2 dry carpels, which adhere by their opposite faces (*Commissure*) to a common axis (*Carpophore*), at length separating, and suspended from the forked summit of the carpophore. Each carpel is indehiscent, marked with 5 longitudinal primary ribs, and often with secondary ones alternate with the first. In the substance of the pericarp, little oil tubes (*vittæ*) are usually embedded opposite the intervals between the ribs, or opposite the ribs themselves. These are receptacles of colored volatile oils.

A very large order of very important plants, natives principally in damp or wet soils, in most of the cooler parts of the world. The herbage is often per-

vaded by an acrid narcotic principle, which renders it very poisonous, as in *Conium maculatum*, fig. 11, and the *Cicuta*. But the seeds contain volatile oil, generally of an aromatic and stimulant nature, and never poisonous. Such are the Coriander, Caraway, Dill, Fennel, and Anise, which for their aromatic seeds are used in cookery and medicine. The roots also are often fleshy and nutritious, as in the Carrot and Parsnip. Even the herbage of some species is wholesome and stimulant. Such are the Celery and Sweet Cicely. The stalks of the former, however, are poisonous, when it grows wild in marshes. In fig. 12 the carpophore of *Pastinaca* (*Parsnip*), is represented supporting the separate carpels; and in fig. 13, the vittæ and ribs of *Daucus* (*the Carrot*), magnified.



Fig. 12.



Fig. 13.

ORDER LVIII.—Araliaceæ.

Herbs, shrubs, or trees. Leaves compound or simple, exstipulate. Flowers in umbels, which are often arranged in racemes, or panicles. Calyx adherent to the ovary, with a small, entire, or 5-toothed limb. Petals 5—10, very rarely wanting, inserted in a disk which crowns the ovary. Stamens as many as the petals, alternate with them. Ovary 2—15 celled, with 1 ovule in each cell. Styles erect, connivent, as many as the cells. Fruit drupaceous, or baccate, the carpels not separating when ripe.

A small order of plants much resembling the last, distinguished chiefly by their several-celled ovary, and cohering carpels. *Aralia* (*Wild Sarsaparilla* and *Petty-morrel*), *Panax* (*Ginseng*), and *Hedera* (*English Ivy*), are examples.

ORDER LIX.—Cornaceæ.

Trees, or shrubs, rarely herbaceous. Leaves opposite, or verticillate, rarely alternate. Calyx-tube adherent to the ovary, limb minute, 4—5 lobed. Petals 4—5, alternate with the calyx lobes, distinct. Stamens as many as the petals, alternate with them, and inserted on the disk that crowns the 1-celled ovary. Fruit a globose berry, crowned by the persistent calyx teeth.

A small order, native of the temperate zones, and distinguished by the astringent properties of their bark. *Cornus* (*Cornel* and *Flowering Dog-wood*) is our only genus.

SECTION II.—MONOPETALÆ.

Flowers with 2 series of floral envelopes, a calyx sometimes bracted at base, and a monopetalous corolla.

Monopetalous Plants not included under Monopetalæ.

Order I.—*Ranunculaceæ*. Herbs, with much dissected leaves. Sepals petaloid, distinct, upper one spurred. Stamens many.

Order XI.—*Fumariaceæ*. Climbing herbs, with decompound leaves.

Order LIV.—*Cucurbitaceæ*. Coarse herbs climbing by tendrils.

Order XCV.—*Nyctaginaceæ*. Leaves opposite; one of each pair smaller than the other. Corolla apparently funnel form, the limb entire.

Monopetalæ proper.

GROUP 1.—Leaves opposite, or verticillate. Calyx more or less adherent to the ovary. Stamens 2—5, distinct. Orders LX.—LXIII. inclusive.

GROUP 2.—Calyx-tube adherent to the ovary. Stamens 5, distinct; or else united by their anthers, or through a great part of their length. Orders LXIV.—LXVI. inclusive.

GROUP 3.—Shrubs with unarmed branchlets; or else evergreen, or leafless herbs. Stamens 4, or more, never didynamous. Ovary single. Anthers usually 2-celled, but never with transverse valves. Orders LXVII.—LXX. inclusive.

GROUP 4.—Herbs. Corolla regular, with equal segments. Stamens 4—8, never didynamous. Ovary 1, entire, 1—2-celled. Styles 1, or 5, with simple stigmas. Corolla neither twisted nor plaited in prefloration. Orders LXXI.—LXXIII. inclusive.

GROUP 5.—Corolla very irregular; or else nearly regular with 4—5 more or less unequal lobes. Ovary single, not lobed, 1—2-



Fig. 11.

celled, rarely a 4—5-celled pod, each cell with two or more ovules. Orders LXXIV.—LXXVIII inclusive.

Group 6.—Leaves simple. Corolla usually more or less irregular. Ovary 4-lobed; or at least in fruit separable into 2—4 achenia; rarely a single achenium. Orders LXXIX.—LXXXI inclusive.

Group 7.—Corolla nearly or quite regular. Stamens 4—12. Ovary single, 1—6-celled. Orders LXXXII.—LXXXVII inclusive.

Group 8.—Corolla 5-parted. Ovary double, generally forming in fruit a pair of follicles. Juice usually milky. Orders LXXXVIII. and LXXXIX.

Group 9.—Shrubs, or trees. Stamens 2. Orders XC. and XCI.

GROUP I.

ORDER LX.—Caprifoliaceæ.

Shrubs, often climbing; rarely herbs. Leaves opposite. Stipules none. Calyx-tube adherent to the ovary; limb 4—5 cleft. Corolla regular, or irregular; limb 4—5-lobed. Stamens 4—5, alternate with the corolla-segments when equalling them in number. Ovary 3—5-celled. Style 1. Fruit usually a berry, or drupe, sometimes dry, always crowned with the persistent calyx-teeth. Seeds pendulous.

An order comprising many ornamental plants, chiefly natives of the temperate zones. *Sambucus* (*Elder*), *Viburnum* and *Lonicera*, one species of which, *L. Caprifolium*, is seen in fig. 14, are examples.



Fig. 14.

ORDER LXI.—Rubiaceæ.

Trees, shrubs, or herbs. Leaves opposite, sometimes verticillate, entire. Stipules present, interpetiolar (292 at 3), sometimes taking the size and appearance of leaves. Calyx-tube more or less adherent to the ovary. Limb 3—5-cleft, sometimes obsolete. Corolla regular, 3—5-lobed. Stamens equalling the number of the corolla-lobes, alternate with them, inserted in the tube. Ovary 2—5-celled. Style entire, or partially divided. Fruit of various forms.

A large order containing 2 suborders represented in our district, *Stellateæ* and *Cinchonæ*. Of *Stellateæ* we have an example in *Galium triflorum*, represented by fig. 15, and of *Cinchonæ* in *Hedyotis caryulea*, fig. 16. This order yields many products of importance, both in Medicine and the Arts. *Madder*,

the most valuable of vegetable red dyes, is found in the roots of *Rubia tinctoria*. *Peruvian Bark* is the product of several species of *Cinchona*, native of South



Fig. 15.

America; and the genuine *Ipecac* is extracted from the roots of *Cephaelis Ipecacuanha*, of Brazil. *Coffeo* is the hard albumen of the seeds of *Coffea Arabica*, a small evergreen tree, native of Arabia.



Fig. 16.

ORDER LXII.—Valerianaceæ.

Herbs. Leaves opposite. Stipules none. Calyx-tube adherent to the ovary; limb 2—4-toothed, or obsolete, or reduced to a kind of pappus. Corolla tubular, or funnel-form, 4—5-lobed, sometimes with a spur at base. Stamens distinct, inserted on the corolla, usually fewer than its lobes. Ovary containing a single ovule, with 1 cell perfect, and 2 abortive ones. Seeds pendulous in the indehiscent pericarp.

A small order of mostly unimportant plants. *Valeriana* (*Valerian*), from one species of which the Valerian of the shops is extracted, and *Fedia* (*Lamb Lettuce*), are examples.

ORDER LXIII.—Dipsacæ.

Herbs. Leaves opposite, or verticillate, sessile. Stipules none. Flowers in dense involucre heads. Calyx-tube adherent to the ovary. Limb somewhat campanulate, entire, or toothed, sometimes taking the form of a pappus. Corolla tubular, with a 4—5-lobed, slightly irregular limb. Stamens 4, distinct, rarely united in pairs, often unequal, inserted on the corolla. Ovary 1-celled, containing 1 ovule. Fruit a bony achenium.

A small order of plants, native only of the old world. Fuller's Teasel (*Dipsacus Fullonum*), and another species, *D. sylvestris*, which is naturalized in various districts of the United States, are examples.

GROUP II.

ORDER LXIV.—Compositæ.

Herbs, or shrubs. Leaves alternate, or opposite, without stipules. Flowers arranged in dense heads, on a common receptacle, and surrounded by an involucre of bracts; the separate flowers often with chaffy bracteoles somewhat like a calyx. Calyx-tube adherent to the ovary; limb obsolete, or present, and



Fig. 17.

assuming the various forms of bristles, hairs, scales, and is termed pappus. Corolla ligulate, or tubular, often 5-cleft, and rarely wanting. Stamens 5, their anthers united in a tube. Ovary 1-celled, 1-ovuled. Style 2-cleft. Fruit a dry indehiscent achenium crowned with the pappus. This order is divided into 3 suborders, Tubulifloræ, Ligulifloræ, and Labiatifloræ, only the 2 first of which are represented in the Northern States. In Tubulifloræ either all the flowers, or the central flowers, are tubular. This structure is exemplified in the Thistle, one species of which (*Cirsium lanceolatum*), is seen in fig. 17, where the flowers are all tubular. In the same figure is shown one of the separate flowers, or florets, with its pappus surrounding the tubular 5-cleft corolla, that incloses the tube of 5 united anthers, through which projects the bifid style. In fig. 18 (*Aster patens*), we have an illustration of the form in which only the central florets are tubular, those of the ray being ligulate, or strap-shaped. The two kinds of florets in

this species are seen in the same figure. In the *Ambrosia artemisiifolia*, fig. 19, we have an example of this sub-order in a reduced form, with monacious flowers destitute of corollas. In the second suborder, Ligulifloræ, the flowers are all ligulate, as in the Dandelion, fig. 20.



Fig. 18.

This is a vast order, much larger than any other in the Natural System, and comprehending about 9000 species. But their importance hardly corresponds with their abundance. The whole order is pervaded by a bitter astringent principle, which is sometimes tonic, as in the Boneset (*Eupatorium perfoliatum*), and the Camomile. In others it is aromatic, as in *Artemisia* (Wormwood), or even acrid, as in *Maruta* (May-weed). The Boneset also has emetic



Fig. 19.

properties. The seeds of the Sun-flower (*Helianthus*), yield a bland oil; and the tubers of the Jerusalem Artichoke (*H. tuberosus*), which are represented in fig. 2, Plate X., are sometimes eaten as food. The Ligulifloræ all have a milky juice, containing a narcotic principle, which, especially in the Lettuce, has been used for opium. The order also includes many highly ornamental, but not delicately beautiful plants, such as the Aster, Dahlia, Zinnia, and Calendula.



Fig. 20.

ORDER LXV.—Lobeliaceæ.

Herbs, or shrubby plants, often with a milky juice. Leaves alternate, without stipules. Flowers often showy, axillary and terminal. Calyx-tube adherent to the ovary; limb 5-cleft, persistent. Corolla irregularly 5-lobed, often somewhat bilabiate, cleft on one side nearly or quite to the base, inserted in the calyx. Stamens 5, inserted with the corolla, above the ovary, united into a tube. Style 1. Stigma fringed. Fruit a 2—3, rarely 1-celled, many-seeded capsule.

An order embracing many splendid ornamental species, and distinguished by acrid and narcotic properties. These are especially developed in the *Lobelia inflata*, which forms so important an article in the *Materia Medica* of Botanic Physicians.

ORDER LXVI.—Campanulaceæ.

Herbs with a somewhat milky juice. Leaves alternate. Stipules none. Flowers usually blue and showy. Calyx-tube adherent to the ovary; limb usually 5-cleft, persistent. Corolla regular, campanulate, usually 5-lobed, withering. Stamens 5, distinct, inserted on the calyx, alternate with the 5 lobes of the corolla. Anthers 2-celled. Ovary 2—5-celled. Style furnished with collecting hairs. Capsule crowned with the persistent calyx-tube, opening with loculicidal dehiscence, many-seeded.

An order remarkable chiefly for the beauty of its flowers. The various species of *Campanula*, such as the Harebell, Canterbury Bell, and Bell-flower, are examples.

GROUP III.

ORDER LXVII.—Ericaceæ.

Shrubs; or evergreen or leafless herbs. Leaves simple, alternate, rarely opposite, often evergreen. Stipules none. Calyx-tube usually free from the ovary, sometimes adherent; limb 4—6, usually 5-cleft, rarely entire. Corolla regular, or sometimes irregular, 4—6, usually, 5-cleft, rarely with 5 distinct petals. Stamens inserted with the corolla, 5, 8, or 10. Anthers 2-celled, opening by pores, often appendaged at top. Ovary 2—10-celled. Style 1. Stigma 1. Fruit a berry, drupe, or capsule.

A large order consisting chiefly of fine-flowering shrubs, one tribe of which, the Heaths, overspread immense tracts of the temperate zones in the old world. The bark and foliage are bitter and astringent, as in the Bear-berry (*Arctostaphylos*), and *Pyrola*, fig. 21, and sometimes narcotic and poisonous, as in the *Rhododendron* (*Rose Bay*, *Swamp Pink*), and *Kalmia* (*Laurel*). Others are



Fig. 21.

stimulant and aromatic, as in the *Gaultheria* (*Checker-berry*, or *Partridge-berry*), fig. 22. The berries of the Whortleberry (*Gaylussacia*), and the Blueberry and Bilberry (*Vaccinium*), are edible and delicious.



Fig. 22.

ORDER LXVIII.—Aquifoliaceæ.

Shrubs, or trees. Leaves simple, alternate, or opposite, often evergreen, exstipulate. Flowers small, white or greenish, axillary, clustered or solitary, often dioecious or polygamous. Calyx-tube free from the ovary; limb 4—6-cleft. Corolla regular, 4—6-

parted, sometimes with distinct petals. Stamens as many as the segments of the corolla, alternate with them, inserted on its base. Anthers opening longitudinally. Ovary 2-celled, with 1 ovule in each cell. Stigmas 2—6. Fruit drupaceous, with 2—6 stones.

A small order of trees and shrubs distinguished by the bitter and tonic properties of the bark and foliage. *Ilex* (*Holly*), the leaves of one species of which are the famous Mate or Tea of Paraguay, and *Prinos* the Black Alder, are examples.

ORDER LXIX.—Ebenaceæ.

Trees, or shrubs. Leaves alternate, simple, often entire, without stipules. Flowers axillary, polygamous. Calyx free from the ovary; limb 3—6-cleft, with equal, persistent segments. Corolla 3—6-cleft, often pubescent. Stamens 2 or 4 times as many as the lobes of the corolla. Ovary with 3 or more cells. Stigmas as many as the cells. Fruit a fleshy berry, with bony seeds.

Diospyros, the Persimmon, several exotic species of which furnish the different kinds of Ebony, is our only representative of this small and chiefly tropical order.

ORDER LXX.—Styracaceæ.

Shrubs, or trees. Leaves alternate, simple, exstipulate. Flowers perfect, bracteate, solitary, axillary, or in axillary racemes. Calyx 5, rarely 4-lobed, adherent either to the base of the ovary, or to the whole of it. Corolla 4—6, usually 5-lobed. Stamens definite, or indefinite, unequal in length, more or less united. Ovary 2—5-celled, the cells opposite the calyx-lobes. Fruit drupaceous, usually with only 1 fertile cell. Seeds 1—5.

A small order chiefly tropical. *Storax* and *Benzoin*, two gum-resins of some value in medicine, are products of two exotic species of *Styrax*. *Halesia*, or the Snow-drop tree, native of the South, is quite common in cultivation at the North.

GROUP IV.

ORDER LXXI.—Primulaceæ.

Herbs. Leaves opposite, verticillate, or alternate, or all radical. Stipules none. Calyx 4—5-cleft, usually persistent, nearly or quite free from the ovary. Corolla regular, 4—5-cleft. Stamens as many as the lobes of the corolla, and inserted opposite them. Ovary 1-celled, with a free, central placenta. Style 1. Stigma 1. Capsule many-seeded; the placenta attached only to the base of the cell, as in the Primrose, fig. 3, Plate XXVI.

An order containing many beautiful plants, but otherwise of little importance. The *Trientalis* and *Lysimachia* (*Loose-strife*), are examples.

ORDER LXXII.—Plantaginaceæ.

Herbs usually acaulescent. Leaves usually in a radical tuft, often ribbed. Calyx 4-cleft, free from the ovary, persistent. Corolla more or less tubular, 4-cleft, scarious, persistent. Stamens 4, alternate with the corolla lobes. Filaments long and weak. Anthers versatile. Ovary 2-celled. Style 1. Capsule a membranaceous pyxis, as in *Anagallis*, fig. 9, Plate XXVI, the cells 1 or several-seeded.

A small and unimportant order found in all countries. The *Plantain* (*Plantago*), is an example.

ORDER LXXIII.—Plumbaginaceæ.

Herbs, or somewhat suffruticose. Leaves simple, alternate, or all radical. Flowers often on simple, or branching scapes. Calyx tubular, 5-toothed, plaited, persistent. Corolla hypocrateriform, with the 5 stamens inserted opposite its lobes, or consisting of 5 distinct unguiculate petals, with the stamens attached to their claws. Styles 5, distinct, or united nearly to the top. Ovary 1-

celled, free from the calyx. Fruit a 1-seeded utricle; or else opening by 5 valves.

A small order, natives usually of salt marshes. The roots of many of them are exceedingly astringent, as in *Statice Caroliniana* (*Marsh-Rosemary*), our only representative.

GROUP V.

ORDER LXXIV.—Lentibulaceæ.

Herbs, growing in the water or mud. Leaves radical; when floating in the water much dissected, and furnished with air-bladders; when growing on land, entire and fleshy. Flowers showy, very irregular. Calyx of 2—5 sepals, distinct, or partially united. Corolla bilabiate, personate, tube very short, spurred. Stamens 2, inserted on the upper lip. Anthers 1-celled. Ovary free from the calyx, 1-celled. Style 1. Fruit a many-seeded capsule.

A small and unimportant order of aquatic or mud plants, distinguished by their showy flowers. *Utricularia* (*Bladder-wort*), is an example.

ORDER LXXV.—Orobanchaceæ.

Herbs, destitute of proper leaves, and parasitic on the roots of other plants. Stem furnished with scales instead of leaves. Calyx persistent, 4—5-parted, or bilabiate free from the ovary. Corolla bilabiate or irregular, 4—5-lobed, withering or persistent. Stamens 4, didynamous. Ovary 1-celled, with 2 parietal placentæ. Style 1. Stigma 2-lobed. Capsule inclosed in the persistent corolla, seeds many, minute.

A small order of parasitic plants, possessing bitter and astringent qualities. *Epiphegus* (*Beech-drops*), is an example.

ORDER LXXVI.—Bignoniaceæ.

Trees, or shrubby, climbing, or twining plants. Flowers usually large and showy. Leaves opposite, rarely alternate, simple, or pinnately parted. Calyx 5-cleft, or 2-cleft, or bilabiate, sometimes spathaceous. Corolla broad at the throat, with a bilabiate or irregularly 5-lobed limb. Stamens 5, 1 or 3 sterile, when 4, often didynamous. Ovary 2-celled, free from the calyx, surrounded by a fleshy disk at base. Style 1. Fruit a woody or coriaceous 2-valved, many-seeded pod. Seeds winged.

Tecoma (*Trumpet-flower*), and *Catalpa*, are examples of this ornamental and chiefly tropical order, to which is attached the following

SUB ORDER.—SESAMEÆ. Herbs, with opposite or alternate leaves, and large axillary flowers, differing from the order proper, chiefly in the fruit, which is drupaceous, or capsular, often tipped with 2 or 4 horns, frequently with 4—8 spurious cells, formed by the divergent lobes of the placenta becoming variously attached to the sides of the pericarp. Seeds few, wingless.

Martynia (*Unicorn-plant*), and *Sesamum*, are examples.

ORDER LXXVII.—Acanthaceæ.

Herbs, or shrubs. Leaves opposite, entire, exstipulate. Flowers with several bracts, often showy. Sepals 5, more or less united, persistent. Corolla bilabiate, or nearly regular, with 5 subequal lobes, convolute in prefloration. Stamens 4, didynamous, sometimes only 2 perfect, the other 2 being sterile, or wanting. Ovary 2-celled, free from the calyx. Style 1. Fruit a 2-valved capsule, with 2 or more seeds in a cell. Seeds roundish, supported by hooked processes of the placenta.

A large tropical order, often ornamental, but possessing no very remarkable plants. *Dianthera* and *Dipteracanthus* are examples found in the U. S.

ORDER LXXVIII.—Scrophulariaceæ.

Herbs, or sometimes shrubby. Leaves opposite, or alternate, sometimes verticillate or radical. Sepals 4—5 persistent, more or less united. Corolla bilabiate, personate, sometimes nearly regular, with 4—5 more or less unequal segments; the lobes imbric-

cate in prefloration. Stamens 4, didynamous, often with the rudiments of a 5th, which is sometimes perfect; oftener still only 2, 1 pair being sterile or wanting. Ovary free, 2-celled. Style 1. Stigma 2-lobed. Capsule 2-valved, many-seeded.

A very large and important order, distinguished generally by bitter and acrid properties, which are sometimes poisonous, and always suspicious. This is especially true of *Digitalis* (*Fox-glove*), the most important medicinal plant

rate nuts or achenia, contained in the tube of the persistent calyx.

A very large and important order, almost universally pervaded by an aromatic, volatile oil, giving them their tonic, cordial, and stomachic qualities.



Fig. 23.



Fig. 24.

of the order, having a remarkable action on the pulsations of the heart. Many of these plants are ornamental; nearly all turn black in drying. Other examples are *Verbascum* (*Mullein*), one species of which, *V. Blattaria*, is seen in fig. 23, *Linaria* (*Toad-flax*), fig. 24, and *Veronica* (*Speedwell*).

ORDER LXXIX.—Verbenaceæ.

Herbs, shrubs; or trees in the tropics. Leaves usually opposite, without stipules. Calyx tubular, free from the ovary, 4—5-cleft, persistent. Corolla tubular; the limb bilabiate, or with 4—5, more or less unequal lobes. Stamens 4, didynamous, sometimes only 2. Ovary entire, 2—4-celled, rarely 1-celled, each cell with 1 ovule. Style 1. Fruit separating into 2 or more indehiscent 1-seeded portions, rarely a single achenium.

A large chiefly tropical order, represented here chiefly by *Verbena*, of which we have several native and exotic species.

ORDER LXXX.—Labiatae.

Herbs, or slightly shrubby plants. Stems square, usually with opposite branches. Leaves opposite or verticillate, usually containing receptacles of volatile oil. Flowers axillary or terminal, in whorls, which sometimes take the form of dense heads; rarely solitary. Calyx tubular, free from the ovary, persistent, 4—5-cleft, or bilabiate. Corolla bilabiate, rarely almost regular, with 4—5 subequal lobes. Stamens 4, didynamous, sometimes only 2, the upper pair being abortive, or wanting. Ovary deeply 4-lobed. Style 1, central, arising from the base of the 4 lobes of the ovary, which in fruit consists of 4, rarely fewer, little sepa-



Fig. 25.

Such are the Sage (*Salvia*), Pennyroyal (*Hedeoma*), fig. 25, the Lavender (*Lavendula*), Peppermint and Spearmint (*Mentha*), and many others. At fig. 26, *Lamium amplexicaule* (*Henbit*), is represented, showing the form of its bilabiate corolla.



Fig. 26.

ORDER LXXXI.—Boraginaceæ.

Herbs; sometimes shrubby plants. Stems round. Leaves alternate, usually rough. Flowers often in 1-sided clusters, unfolding spirally. Calyx free from the ovary, persistent, regular, consisting of 5 sepals, more or less united at base. Corolla regu-

lar, rarely irregular, the limb 5-toothed, often with a row of scales in the throat. Stamens 5, inserted on the corolla alternately with its lobes. Ovary deeply 4-lobed, or at least separating into 4 portions, when mature. Style 1, usually central, proceeding from base of the ovary, sometimes terminal. Fruit consisting of 4 achenia.

A rather large order of mucilaginous, emollient, never poisonous plants. *Borago* (*Borage*), fig. 27, *Symphitum* (*Comfrey*), and *Heliotropium* (*Heliotrope*), are examples.



Fig. 27.

GROUP VII.

ORDER LXXXII.—Hydrophyllaceæ.

Herbs. Leaves alternate, or the lower ones opposite, usually lobed, or pinnatifid. Flowers usually in circinate racemes, or unilateral spikes. Calyx 5-cleft, usually appendaged at the sinuses, persistent. Corolla 5-lobed, regular, with melliferous scales or grooves near the base. Stamens 5, inserted on the base of the corolla, alternate with its lobes. Anthers 2-celled. Ovary free, 1-celled. Style 1, bifid. Stigmas 2. Capsule invested with the permanent calyx. Seeds few, crustaceous.

A small order of unimportant, chiefly N. American plants, represented by *Hydrophyllum* (*Water-Leaf*, *Burr-Flower*).

ORDER LXXXIII.—Polemoniaceæ.

Herbs. Leaves opposite, rarely alternate, simple or compound. Calyx free from the ovary, 5-cleft, persistent. Corolla regular, with a 5-lobed limb, convolute in prefloration. Stamens 5, inserted on the corolla, alternately with its lobes, often unequal in length. Ovary 3-celled. Style 1. Stigma trifid. Capsule 3-celled, 3-valved, loculicidal, the valves separating from the 3-angled axis, which bears the few, or many seeds.

A small order consisting chiefly of N. American plants. *Phlox* and *Polemonium* (*Greek Valerian*), are examples.

ORDER LXXXIV.—Diapensiaceæ.

Low, prostrate, evergreen under-shrubs. Leaves crowded, heath-like. Flowers terminal and solitary. Sepals 5, distinct, with 3 bracts at base. Corolla regular, deeply 5-lobed, with the lobes imbricated in prefloration. Stamens 5, inserted by their petaloid filaments on the corolla-tube. Anthers 2-celled, with transverse valves. Ovary 3-celled, free. Style 1. Stigma 3-lobed. Capsule 3-valved. Seeds small, many.

An order consisting of only two plants, *Diapensia* Lapponica, native of the White Mountains, and *Pyxidanthra*, found in the Pine barrens of N. Jersey.

ORDER LXXXV.—Convolvulaceæ.

Herbs, or shrubs; often with a milky juice. Stems trailing or climbing, rarely erect. Leaves alternate, sometimes none. Stipules none. Flowers often showy. Sepals 5, usually more or less united at base, persistent. Corolla regular, limb 5-cleft or entire, twisted and plaited in prefloration. Stamens 5, inserted at the base of the corolla, alternate with its segments, when lobed. Ovary 2—4, rarely 1-celled, free from the calyx. Style 1, rarely more. Fruit a capsule, 2—4-celled, opening by septifragal dehiscence. Seeds few, large.

A numerous order of plants, very abundant in the tropics, and often distinguished by the beauty of their large flowers. Their juices contain a resinous purgative principle, especially developed in the roots of *Convolvulus* Jalapa of Mexico, and *C. Scammonia* (*Scammony*), of the Levant. Sometimes this principle is present in so small quantities, that the large farinaceous roots become valuable as articles of food, as in the *C. Batatas*, or Sweet Potato.

The suborder, *Cuscutineæ*, is distinguished by its leafless colored stems and filiform, spirally coiled embryo, destitute of cotyledons, and is represented by the *Cuscuta* (*Dodder*), fig. 8, Plate V.

ORDER LXXXVI.—Solanaceæ.

Herbs, or shrubby plants with a colorless juice. Leaves alternate. Calyx free from the ovary, consisting of 4—5 persistent sepals, more or less united at base. Corolla regular, rarely slightly irregular, limb 4—5-cleft, plaited in prefloration. Stamens as many as the corolla lobes, alternate with its segments. Ovary 2, and rarely 4 or 6-celled, with a central placenta. Fruit a many-seeded capsule or berry.

A large order distinguished usually by the dull lurid color of their flowers. The herbage and fruit are usually pervaded by a powerful narcotic principle, which renders them often violently poisonous and always injurious. Their active properties give to many of them importance in a medicinal point of view. Such are the Henbane (*Hyoscyamus niger*), the Belladonna (*Atropa*



Fig. 28.

Belladonna), and the Bittersweet (*Solanum Dulcamara*), fig. 23. The deleterious Tobacco, also, belongs here. The tuber is sometimes edible, as in the Potato (*Solanum tuberosum*); and sometimes, also, the fruit is wholesome, as in the Tomato (*Lycopersicum*), and the Egg-plant (*Solanum Melongena*).

ORDER LXXXVII.—Gentianaceæ.

Herbs, usually smooth, with a watery juice. Leaves usually opposite, rarely alternate, radical or single. Flowers regular, usually terminal or axillary, often showy. Calyx of 4—12 sepals,

united at base. Corolla convolute, sometimes induplicate in prefloration, 4—12-parted, regular. Stamens as many as the segments of the corolla, inserted on the tube, alternately with them. Ovary 1-celled, free, sometimes apparently 2-celled, on account of the 2 introflexed placentæ. Style 1, or wanting. Stigmas usually 2, sometimes 1.

as many, which are united in pairs by a connecting thread, and are attached to the glands of the stigma, from which they soon hang loose, being released from their cells. Ovaries 2. Styles 2, often very short. Stigmas united into 1 column for both ovaries. Fruit consisting of 2 follicles, 1 sometimes abortive. Seeds usually with a coma.



Fig. 29.

An order of beautiful plants generally pervaded by an intensely bitter tonic principle. *Gentiana* (*Gentian*), fig. 29, and *Menyanthes* (*Buckbean*), are examples.

GROUP VIII.

ORDER LXXXVIII.—Apocynaceæ.

Trees, shrubs, or herbs, with a milky juice. Leaves opposite, or verticillate, rarely alternate, without stipules. Flowers regular. Sepals 5, united, persistent. Corolla 5-lobed, twisted in prefloration. Stamens 5, alternate with the segments of the corolla. Filaments distinct. Anthers 2-celled, sometimes slightly connected. Ovaries 2, distinct, rarely united, but with 2 united styles or stigmas. Fruit usually a pair of follicles, 1 sometimes abortive. Seeds often with a coma, or tuft of hairs.

A chiefly tropical order, distinguished by the active, usually poisonous properties of the juice, which usually contains more or less strychnine, which is generally obtained from an East Indian species of *Strychnos*. Some of the plants that yield the Upas belong to this genus, as also that which furnishes the dreaded Woorari poison of Gulana. The juice, also, yields caoutchouc, which, in Sumatra, is obtained from the *Urceola elastica*. *Apocynum* (*Dog-bane*, *Indian Hemp*), and *Nerium* (*Oleander*), are examples.

ORDER LXXXIX.—Asclepiadaceæ.

Herbs, or shrubs, usually with a milky juice. Leaves usually opposite, sometimes alternate or verticillate. Flowers generally in umbels, sometimes in racemes or corymbs. Sepals 5, slightly united at base. Corolla regular, consisting of 5 nearly distinct petals. Stamens 5, inserted at the base of the corolla, alternate with its segments united by their filaments into a tube. Anthers 2-celled. Pollen cohering in masses as many as the cells, or twice



Fig. 30.

A large and chiefly tropical order, with properties much like the last, but less active. The various species of *Asclepias*, two of which are seen in figs. 30 and 31, are our principal Northern representatives.



Fig. 31.

GROUP IX.

ORDER XC.—Jasminaceæ.

Shrubs, often with twining stems. Leaves opposite or alternate, often compound. Flowers corymbose, white or yellow, usually fragrant. Calyx 5—10-cleft, persistent. Corolla regular, hypocrateriform; limb with 5—10 divisions, imbricate, and twisted in prefloration. Stamens 2, inserted on the corolla, and inclosed within its tube. Ovary free, 2-celled, each cell with 1 ovule. Style 1. Stigma 2-lobed. Fruit a double berry, or a capsule separating into 2 portions. Seeds 2.

A small order chiefly of tropical or Indian shrubs. *Jasminum* (the *Jessamine*), is very commonly cultivated.

ORDER XCI.—Oleaceæ

Trees, or shrubs. Leaves opposite, simple or pinnate. Flowers perfect, or polygamous. Sepals united at base, persistent, sometimes none. Petals 4, united below, sometimes distinct, valvate in prefloration, sometimes none. Stamens 2. Anthers 2-celled. Ovary free, 2-celled. Ovules pendulous. Style 1. Stigma 1, or bifid. Fruit drupaceous, baccate, or a samara, usually 1-celled, 1—2-seeded, by abortion.

A small order containing many ornamental plants, as *Syringa* (*Lilac*) and *Chionanthus* (*Fringe-tree*). The European Olive yields Olive-oil. Manna exudes from the trunk of a European species of Ash.

SECTION III.—APETALÆ.

Plants with only a single series of floral envelopes (calyx), or with none.

Apetalous plants not included under Apetalæ.

Order I.—Ranunculaceæ. Herbs. Flowers perfect. Ovaries several, or many, 1-celled, rarely single in plants with compound leaves.

Order XX.—Caryophyllaceæ. Herbs, not aquatic. Leaves opposite or verticillate. Flowers perfect. Stamens 3 or 10.

Order XXXIV.—Zanthoxylaceæ. Prickly shrubs.

Order XXXVI.—Aceraceæ. Trees with palmately-lobed leaves. Flowers in umbels or loose paniculate clusters. Sepals 5, usually colored.

Order XLV.—Rosaceæ. Herbs with pinnate stipulate leaves. Flowers in spikes or heads.

Order XLIX.—Onagraceæ. Aquatic, or mud plants, with alternate or verticillate leaves. Flowers axillary, solitary, sessile. Stamens 8, 4, 3, or 1.

Order LIV.—Crassulaceæ. Herbs. Calyx 5-parted. Ovaries of 5 partly-united carpels.

Order LVI.—Saxifragaceæ. Herbs. Leaves opposite. Flowers perfect. Stamens 8, rarely 10.

Order LXIV.—Compositæ. Herbs. Monœcious. Staminate flowers consisting of several 6-toothed florets, composed of 5 stamens, partially united by their anthers.

Order XCI.—Oleaceæ. Trees with pinnate leaves. Stamens 2. Fruit a samara.

Apetalæ proper.

Group 1.—Herbs, or shrubby climbers. Flowers perfect. Calyx present. Stamens 6, 10, or 12. Ovaries several-celled. Orders XCII. and XCIII.

Group 2.—Herbs. Leaves simple, never opposite in climbing species. Flowers perfect, and the styles or stigmas 1, or more; or else declinous, and the styles or stigmas 2 or more. Ovary 1-celled, 1-ovuled, free from the calyx. Orders XCIV.—XCVII. inclusive.

Group 3.—Trees, or shrubs; rarely herbs with a 5-parted adherent calyx. Flowers never in aments or globular balls. Stamens 3—9. Styles or stigmas 1—2. Orders XCVIII.—CIII. inclusive.

Group 4.—Aquatic, or marsh herbs. Flowers perfect or polygamous, with a several-celled ovary; or else monœcious, with a 1-celled ovary, and the stamens 12 or more. Orders CIV.—CVII. inclusive.

Group 5.—Herbs, or evergreen shrubs. Ovary several-celled, becoming in fruit a capsule or drupe. Orders CVIII. and CIX.

Group 6.—Trees, or shrubs. Flowers monœcious, or dioecious. Staminate flowers, and frequently the pistillate flowers also, in dry oblong or cylindrical aments. Orders CX.—CXIV. inclusive.

Group 7.—Trees with palmately-lobed leaves. Flowers in dry globular aments. Orders CXV. and CXVI.

Group 8.—Trees, or shrubs, usually with a milky or yellow juice; or else herbs with a watery juice. Order CXVII.

GROUP I.

ORDER XCII.—Aristolochiaceæ.

Herbs, or shrubby plants; in the latter case often climbing. Leaves alternate or radical. Flowers perfect, solitary, of a dull brown or greenish color. Calyx-tube more or less adherent to the ovary; limb 3-cleft. Stamens 6 or 12, epigynous, or adherent to the base of the short and thick style. Ovary 3 or 6-celled. Stigmas radiate, as many as the cells of the ovary. Fruit a many-seeded capsule or berry.

A small order of chiefly tropical plants, distinguished by their stimulant and tonic properties. *Asarum* (*Wild Ginger*), and *Aristolochia* (*Virginia Snake-root*), are examples.

ORDER XCIII.—Phytolaccaceæ.

Herbs, rarely shrubby. Leaves alternate, without stipules. Flowers perfect, in racemes. Sepals 4—5, petaloid. Stamens 4—5 and alternate with the sepals; or else 10 or more. Ovary 1 or several-celled. Styles and stigmas as many as the cells. Fruit dry or baccate, consisting of 1, or several 1-seeded carpels.

A small, chiefly tropical order, represented here by a single species of *Phytolacca* (*Pokeweed*).

GROUP II.

ORDER XCIV.—Chenopodiaceæ.

Herbs, rarely shrubby. Leaves alternate, often more or less succulent or fleshy. Sometimes none. Flowers greenish, inconspicuous, usually perfect, sometimes dioecious or polygamous. Calyx sometimes tubular at base, persistent. Stamens as many as the calyx-segments, or fewer, inserted at their base. Ovary free, 1-celled, 1-ovuled. Styles 2—4, rarely 1. Fruit a utricle.

An order of weedy, unimportant, often maritime plants. *Chenopodium* (*Goosefoot*, *Pigweed*), *Beta* (*Beet*), and *Salicornia* (*Samphire*), are examples.

ORDER XCV.—Amaranthaceæ.

Herbs, or shrubs. Leaves alternate, without stipules. Flowers in heads or spikes, or dense clusters, furnished with dry and scarious, usually colored bracts. Calyx consisting of 3—5, dry and scarious, persistent sepals. Stamens 3—5, or more, hypogynous, distinct or monadelphous. Ovary free, 1-celled, with 1 or more ovules. Fruit a utricle, rarely a many-seeded capsule.

An order of plants containing a few species whose brightly-colored and imperishable flowers are ornamental, but the greater portion are mere weeds. *Amaranthus*, *Gomphrena* (*Globe Amaranth*), and *Celosia* (*Cockscomb*), are examples.

ORDER XCVI.—Nyctaginaceæ.

Herbs, or shrubs. Leaves opposite, one of each pair smaller than the other. Calyx colored, infundibuliform, often with 2 bracts resembling a calyx at base, at length separating from the lower part, which hardens and incloses the achénium. Stamens

hypogynous, 1—20. Ovary free, 1-celled. Style 1. Stigma 1. Fruit an achenium.

A small and mostly tropical order. Several species of *Mirabilis* (*Four-o'clock*, *Marvel of Peru*), are cultivated here.

ORDER XCVII.—Polygonaceæ.

Herbs, or shrubs. Leaves alternate. Stipules ochreate, rarely none. Flowers usually perfect. Sepals 4—6, more or less united at base, often petaloid. Stamens definite, inserted on the base of the sepals. Ovary free, 1-celled, 1-ovuled. Styles or stigmas 2 or 3. Achenium usually triangular or oblong.

An order widely distributed through the world, and containing some important plants. Buckwheat (*Polygonum Fagopyrum*), belongs here. The Sorrel and Garden Rhubarb (*Rheum*), are distinguished by the acid juices of their stalks and leaves. Some unknown Tartarian species yields the Rhubarb

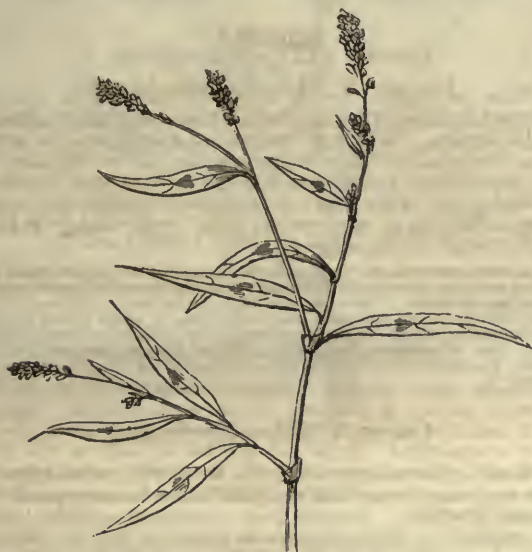


Fig. 32.

of the shops. The roots of the Yellow-Dock (*Rumex*), possess powerful antiscorbutic properties, and are a popular remedy for skin diseases. In fig. 32, *Polygonum Persicaria*, with its peculiar sheathing stipules (*Ochrea*), is represented.

GROUP III.

ORDER XCVIII.—Lauraceæ.

Trees, or shrubs. Leaves alternate, usually punctate with pellucid dots, destitute of stipules. Flowers perfect, or dioeciously polygamous. Sepals 4—6, more or less united at base, imbricated in 2 series. Stamens definite, usually more numerous than the sepals, inserted on their base. Anthers 2—4-celled, opening by recurved valves from base to apex. Ovary, style and stigma single. Fruit a berry or drupe, usually with a thickened pedicel. Seed large, with a conspicuous embryo.

An order consisting chiefly of tropical trees, distinguished by their stimulant and aromatic properties, owing to the presence of a volatile oil. Cinnamon is obtained from the *Cinnamomum Zeylanicum* and the inferior Cassia bark, which in this country and Europe is generally sold for Cinnamon, from the *C. aromaticum* of China. Camphor is obtained from the different species of *Camphora*, natives of China, Japan, and the Eastern Archipelago. The order is represented at the North by *Sassafras* and *Benzoin* (*Fever-bush*).

ORDER XCIX.—Thymeleaceæ.

Shrubs with a tough bark. Leaves alternate, or opposite, entire. Flowers perfect. Calyx petaloid, tubular, free from the

ovary; limb usually 4-cleft, the lobes imbricated in prefloration, sometimes entire. Stamens definite, usually twice as many as the calyx-lobes, inserted in its throat. Ovary with 1 ovule. Style 1. Stigma 1. Fruit drupaceous.

An order distinguished as well by the acrid and even blistering properties of the bark, as by its toughness. *Dicra* (*Leatherwood*), and *Daphne* (*Maereon*), are examples.

ORDER C.—Eleagnaceæ.

Trees, or shrubs, usually covered by a kind of scurf. Flowers axillary, dioecious, rarely perfect. Calyx of the sterile flowers 4-parted. Stamens 3—8, sessile. Anthers 2-celled. Calyx of the fertile flowers tubular, persistent, with an entire or 2—4-lobed limb. Ovary simple, 1-celled, with a single stipitate ovule. Fruit a crustaceous achenium, free from, but inclosed in, the calyx, which becomes succulent and baccate.

A very small order possessing no remarkable qualities. The *Eleagnus* (*Oleaster*), cultivated for its silvery foliage, is an example.

ORDER CI.—Santalaceæ.

Trees, shrubs, or herbs. Leaves alternate, entire. Flowers small, perfect, rarely dioecious, polygamous. Calyx-tube adherent to the ovary; limb 4—5-cleft. Stamens as many as the lobes of the calyx, and inserted opposite them. Ovary 1-celled, with 1—4 ovules. Style 1. Fruit indehiscent, crowned with the persistent calyx, often drupaceous.

A small and rather unimportant order, native chiefly of the warmer portions of the world. An Indian species of *Santala* yields the fragrant Sandalwood. *Comandra* (*Toad-flax*), and *Nyssa*, the Gum-tree, are examples.

ORDER CII.—Loranthaceæ.

Shrubs, parasitic on trees. Stems dichotomously branching. Leaves opposite, entire, coriaceous, of a dull green color. Flowers small, often dioecious, rarely perfect and brilliant. Calyx-tube adherent to the ovary of the perfect flower. Limb obsolete or 3—5-cleft. Petals 3—8, cohering in a tube or distinct, sometimes none. Stamens as many as the petals, and inserted on them when present, otherwise they are inserted on the base of the sepals, 1 to each. Ovary 1-celled, 1-ovuled. Fruit a globular 1-seeded berry.

A large parasitic order, represented in N. J. and the South by the *Mistletoe* (*Viscum*).

ORDER CIII.—Ulmaceæ.

Trees, or shrubs. Leaves alternate, simple, rough. Stipules 2 at the base of each leaf, deciduous. Flowers in loose axillary clusters, rarely solitary, perfect or polygamous. Calyx free from the ovary, campanulate, 4—5-cleft. Stamens as many as the calyx-lobes, and opposite them; or else more numerous. Ovary 1-celled, 1—2-ovuled. Styles or stigmas 2. Fruit 1-celled, 1-seeded, either a samara or berry-like drupe.

A small order consisting chiefly of trees, useful merely as timber. *Ulmus*, the *Elm*, one species of which, the well-known Slippery Elm, is an example.

GROUP IV.

ORDER CIV.—Saururaceæ.

Herbs, with the stems jointed at the nodes. Leaves alternate, entire. Flowers perfect, in spikes or racemes, entirely destitute of floral envelopes. Stamens definite, persistent, usually 6—8. Anthers 2-celled. Ovary consisting of 3—5 partially united carpels. Styles 3—5, distinct. Capsule or berry 3—5-celled, each cell usually 1-seeded.

Unimportant marsh plants, represented here by *Saururus* (*Lizard's-tail*).

ORDER CV.—Ceratophyllaceæ.

Aquatic herbs. Leaves whorled, dichotomously dissected, with filiform segments. Flowers monœcious, axillary, sessile. Stamens indefinite. Anthers sessile. Ovary 1-celled. Style 1, filiform. Achenium beaked in fruit. Seed with 4 cotyledons.

A very small unimportant order, represented by the *Ceratophyllum* (*Hornwort*).

ORDER CVI.—Callitrichaceæ.

Aquatic, annual herbs. Leaves opposite, entire. Flowers axillary, solitary, minute, perfect, or monœcious, entirely destitute of proper floral envelopes, but usually furnished with a pair of bracts. Stamens 1, rarely 2, with a slender filament and a 1-celled, 2-valved reniform anther. Ovary 4-lobed, 4-celled, 4-ovuled. Styles 2. Fruit indehiscent, 4-seeded.

Little plants floating in water, consisting chiefly of the various species of *Callitriche* (*Water Starwort*).

ORDER CVII.—Podostemaceæ.

Aquatic herbs, with the habit of Liverworts or Mosses. Leaves capillary or linear, not articulated to the stem. Flowers usually perfect, arising from a kind of spathe, usually destitute of any other floral envelopes. Stamens often reduced to 1 or 2, and monadelphous. Ovary free, 1—3-celled. Styles or stigmas 2, distinct. Fruit a many-seeded, ribbed, 2—3-celled capsule.

A very small aquatic order, of which *Podostemum* (*Thread-foot*), is an example.

GROUP V.

ORDER CVIII.—Euphorbiaceæ.

Herbs, shrubs, or even trees, often with a milky juice. Leaves opposite, alternate, or verticillate, usually simple, often stipulate. Flowers monœcious or dioecious. Staminate and pistillate flowers usually separate, but often combined and surrounded by a common, mostly petaloid involucre, the staminate being reduced to a single stamen, and the pistillate to a compound pistil, destitute of calyx, and supported on a conspicuous jointed pedicel. Calyx, when present, several-lobed. Petals sometimes present, and as many as the calyx-lobes. Stamens definite or indefinite, distinct or monadelphous. Anthers 2-celled. Ovary free from the calyx, when the latter is present, consisting of 2—9 more or less united carpels, attached to a prolongation of the axis. Styles as many as the carpels, distinct, often 2-cleft. Fruit a capsule separating into its component carpels.

A very large chiefly tropical and South American order, distinguished by the acrid and often powerfully poisonous properties of its milky juice. But the starchy accumulations in the root of *Jatropha*, when freed by washing and heat from the volatile principle, become the *Tapioca* of commerce. The seeds of *Ricinus* yield the common purgative Castor-oil, while those of certain E. Indian species of *Croton* furnish the powerful *Croton* oil. Caoutchouc is obtained from the *Siphonia*, a beautiful tree of South America, and also some other trees belonging here. *Euphorbia* (*Spurge*), and *Buxus* (*Box*), are examples.

ORDER CIX.—Empetraceæ.

Low, evergreen, heath-like shrubs. Leaves acerose, crowded. Flowers small, dioecious or polygamous, axillary. Calyx of several imbricated sepals; or its place is supplied by imbricated bracts. Stamens few, definite. Ovary 3—9-celled, with 1 ovule in a cell. Styles short, or none. Stigmas more or less lobed, often laciniate. Ovary drupaceous, inclosed in the persistent calyx, containing 3—9 bony nutlets.

A very small order, represented here by *Empetrum* (*Crowberry*), and *Corema*.

GROUP VI.

ORDER CX.—Juglandaceæ.

Trees. Leaves unequally pinnate. Stipules none. Flowers greenish, monœcious. Sterile ones in aments. Calyx membranous, irregular. Stamens indefinite. Fertile flowers usually in small clusters. Calyx-tube adherent to the ovary; limb 3—5-parted. Petals sometimes present, and as many as the calyx-segments. Ovary 1-celled, partially 2—4-celled, 1-ovuled. Fruit drupaceous, the epicarp sometimes indehiscent, sometimes regularly dehiscent; endocarp bony. Seeds single, oily, often edible.

A small order, containing, however, many forest trees, valuable for their timber, and often for their fruit. The Butternut and Black Walnut (*Juglans*), and the Hickory, Shag-bark, and other species of *Carya*, are examples.

ORDER CXI.—Cupuliferæ.

Trees, or shrubs. Leaves simple, alternate, with straight veins and deciduous stipules. Flowers usually monœcious. Sterile ones in aments. Calyx membranous and regular, or else scale-like. Stamens 1—3 times as many as the calyx-lobes. Fertile flowers separate, in clusters of 2 or 3; or else several together, inclosed in a common involucre. Calyx-tube adherent to the ovary; limb minute or obsolete. Ovary 2—6-celled, with 1 or more ovules in a cell. Fruit a 1-celled, 1-seeded nut.

An order consisting chiefly of noble forest-trees of the highest value for timber, and sometimes also for their fruit. Such are the various species of Oak (*Quercus*), the Beech (*Fagus*), and the Chestnut (*Castanea*). The bark of the various species of Oak possesses a great deal of Tannin, which makes it valuable for tanning leather. Galls are swellings on the leaf-stalks and twigs of Oak trees; those of commerce being yielded by the *Quercus infectoria* of Asia Minor. The thick outer bark of *Q. Suber* of Spain is the substance known as Cork.

ORDER CXII.—Myricaceæ.

Shrubs. Leaves simple, aromatic, dotted with resinous glands. Flowers monœcious or dioecious. Sterile ones in aments, each in the axil of a bract. Stamens 2—6. Anthers 2—4-celled, opening lengthwise. Fertile flowers in aments or globose clusters. Ovary 1-celled, 1-ovuled, surrounded by several scales. Stigmas 2, subulate, or dilated and somewhat petaloid. Fruit a drupe-like, 1-seeded nut.

A small order, represented here chiefly by the Bayberry (*Myrica*), and the Sweet Fern (*Comptonia*).

ORDER CXIII.—Betulaceæ.

Trees, or shrubs. Leaves simple, alternate, with deciduous stipules. Flowers monœcious; both kinds in aments, usually achlamydeous, axillary, by threes in a 3-lobed bract. Stamens definite, distinct. Ovary 2-celled, 2-ovuled. Styles or stigmas 2. Fruit 1-celled by abortion, 1-seeded, membranous, or dehiscent, forming with the bracts a dense, sometimes cone-like, ament.

A small order, of which the various species of Birch (*Betula*), and Alder (*Alnus*), are the most common representatives.

ORDER CXIV.—Salicaceæ.

Trees, or shrubs, rarely somewhat herbaceous. Leaves alternate, simple, with deciduous or persistent stipules. Flowers dioecious; both kinds in aments, achlamydeous, in the axils of 1-flowered bracts. Stamens 2—several, distinct or monadelphous. Ovary 1-celled, 2-valved. Seeds numerous, with a silky coma.

The various species of Willow (*Salix*), and Poplar (*Populus*), constitute this order. In fig. 33 is represented *Salix eriocephala*, one of the common species, both as it appears when in blossom in the spring, and after the full expansion of the leaves. The bark is bitter and tonic, and is sometimes employed as a febrifuge. The slender flexible shoots of the Willows are used in wicker work.



Fig. 88.

GROUP VII.

ORDER CXV.—Balsamifluæ.

Trees, with palmately-lobed, alternate leaves. Stipules deciduous. Flowers monœcious in globular aments, achlamydeous. Anthers numerous, nearly sessile, with scales intermixed. Ovary 2-celled, surrounded by scales. Styles 2. Capsules 2-celled, 2-beaked, opening between the beaks, indurated in fruit, and forming a kind of strobile. Seeds several-winged.

An order consisting solely of the genus *Liquidambar*, of which one species extends as far north as Connecticut.

ORDER CXVI.—Platanaceæ.

Trees. Leaves alternate, palmately-lobed. Stipules scarious, sheathing. Flowers monœcious, achlamydeous, in globose aments. Stamens solitary, mingled with small scales. Anthers linear, 2-celled. Ovary 1-celled, tipped with a thick style, stigmatic on one side. Fruit a 1-seeded, clavate nut, surrounded at base by bristly hairs.

An order consisting merely of the different species of *Platanus* (*Plane-tree*, *Buttonwood*, *Sycamore*).

GROUP VIII.

ORDER CXVII.—Urticaceæ.

Trees, or shrubs, usually with a milky or yellowish juice; or herbs with a watery juice. Leaves alternate or opposite, often rough or hispid, with stinging hairs, frequently stipulate. Flowers monœcious, diœcious, or polygamous, in panicles, aments, or

fleshy heads. Calyx regular, persistent, rarely wanting, usually 3—5-parted. Stamens definite, distinct, inserted on the base of the calyx, usually as many as its lobes, and opposite them. Ovary free from the calyx, 1-ovuled. Style 1. Fruit a 1-seeded utricle, surrounded by the membranous or fleshy calyx.

A very large family, assuming a great variety of forms. The milky juice of this order is acrid and injurious, often highly poisonous. It abounds especially in caoutchouc, which is yielded in great abundance by several S. American and E. Indian trees of this order. The famous Cow-tree, which yields a rich wholesome milk, is, however, an exception to the deadly qualities of this juice. *Bohon Upas*, one of the most fearful of poisons, is the concrete juice of another arborescent species, native of the Indian Islands. But the fruits are generally innocent, and often edible and delicious. Such are the Bread-fruit, produced by two species of *Artocarpus*, the Fig, and the Mulberry. The celebrated Banian, figure 14, Plate VI., yields the Gum-Lac, which is an exudation from its branches. The stinging hairs of the Nettles are known by experience to every one. The tough fibres of their stems, and also of Hemp (*Cannabis*), are used for cordage, coarse strong cloths, and bagging. The leaves of the Hemp are also used in the East, on account of their stimulant and narcotic properties, to produce intoxication. Hops consist of the dried strobiles, or aments, of the *Humulus Lupulus*. The principle which gives them their power, exists chiefly in the yellow, resinous grains, that cover the scales and fruit.

SUBCLASS II.—GYMNOSPERMS.

Ovules not inclosed in an ovary, possessing no pericarp, and becoming naked seeds. The carpel is sometimes represented by an open scale, and sometimes is wholly wanting.

ORDER CXVIII.—Coniferæ.

Trees, or shrubs; the wood abounding in a resinous juice. Leaves acerose, or scale-like, almost always evergreen. Flowers monœcious, or diœcious, entirely destitute of calyx and corolla. Stamens 1, or more, often monadelphous, forming a sort of loose ament. Fertile flowers usually in aments, consisting of open carpellary scales, sometimes solitary and destitute of any form of

carpel. Ovary, style and stigma wanting. Ovules naked, 1, 2, or more, erect, or sometimes turned downward. Fruit a strobile, or cone, sometimes drupaceous, or a solitary drupaceous seed. Embryo with 2, or frequently more cotyledons.

A very important family, most abundant in cold regions, and there of the highest use to man, as it includes all the most valuable timber-trees of such countries. The resinous products, such as turpentine, pitch, and resin, are of the greatest importance in navigation, and many of the arts.

CLASS II.—ENDOGENS.

Stems not distinguishable into regular layers of bark, pith, and wood in the woody species, growing by additions on the *inside*. Leaves usually parallel-veined, entire, often sheathing at base, rarely attached to the stem by a regular articulation. Parts of the flowers usually in threes or multiples of 3. Seeds with 1 cotyledon, rarely with 2 alternate ones.

GROUP 1.—Mostly aquatic and marsh plants. Flowers monœcious, diœcious, or perfect. Perianth absent; or else present, rarely monosepalous, otherwise consisting of 4 or 6 distinct sepals, in 1 series, and the flowers sessile on a spadix, or in dense spikes. Orders CXIX.—CXXI. inclusive.

GROUP 2.—Leaves parallel-veined, sometimes linear, often fleshy. Perianth of 6, rarely 3 divisions, the segments in 1 or 2 series often of different colors. Ovaries 3, or more, partially united; or else single, adherent to the tube of the perianth, and 1 or more than 5-celled. Orders CXXIII. and CXXIV.

GROUP 3.—Perianth with 6 very irregular segments, and the tube adherent to the twisted ovary. Stamens consolidated with the style in a column, either with granular pollen, or with 2—4 pollen-masses attached to the stigmas in pairs. Order CXXV.

GROUP 4.—Leaves parallel-veined. Flowers perfect, not glumaceous. Perianth of 6 colored segments, more or less adherent to the ovary. Orders CXXVI.—CXXVIII. inclusive.

GROUP 5.—Leaves reticulately-veined. Segments of the perianth 6, often in 2 differently-colored series. Orders CXXIX.—CXXXI. inclusive.

GROUP 6.—Perianth tubular, colored, 6-parted, or bilabiate; or else consisting of 6, rarely 4, similarly colored segments. Ovary free from the perianth. Orders CXXXII.—CXXXV. inclusive.

GROUP 7.—Perianth segments in 2 series; the outer glumaceous, or herbaceous; the inner petaloid. Orders CXXXVI. and CXXXVII.

GROUP 8.—Flowers crowded into dense hemispherical heads. Perianth tubular. Order CXXXVIII.

GROUP 9.—Flowers glumaceous, arranged in spikelets, and included in glumes, or bracts. Ovary 1-celled, 1-seeded. Orders CXXXIX. and CXL.

GROUP I.

ORDER CXIX.—Araceæ.

Herbs, or tropical shrubs, with a fleshy rhizoma, or corm. Leaves sheathing at base, simple, or compound, sometimes with more or less reticulated veins. Flowers usually sessile in a terminal, or lateral spadix, sometimes monœcious and achlamydeous; sometimes perfect with a perianth of 4—6 sepals. Stamens definite in the perfect flowers, 4—6, usually indefinite in the monœcious flowers. Ovary free from the perianth, 1—several-celled. Seeds solitary, or several. Fruit usually a proper berry, sometimes dry.

A small and chiefly tropical order, remarkable for acidity, which is especially developed in their roots. This principle is, however, volatile, and can be expelled by heat, and in this way the starchy corms of some species are rendered edible. Arum (*Wake Robin*), Calla, Symplocarpus (*Skunk Cabbage*), and the well-known aromatic Sweet Flag (*Acorus*), are examples.

ORDER CXX.—Typhaceæ.

Herbs of marshes and ditches. Stems without joints. Leaves ensiform, rigid. Flowers monœcious, arranged in a spadix, which

is destitute of a spathe, or in globose heads. Perianth of 3 sepals, or none. Stamens 3—6, with long and slender filaments, and cuneiform anthers. Ovary free from the perianth, 1-celled, 1-seeded. Stigmas 1—2. Fruit a utricle.

A small unimportant order, consisting solely of two genera, *Typha* (*Cattail*), and *Sparganium* (*Burr-reed*). The seed-down of the former is an article of considerable use to upholsterers, in the manufacture of beds and pillows.

ORDER CXXI.—Lemnaceæ.

Floating plants of a cellular structure. Stems and leaves merged in a frond, from the bottom of which the roots descend, hanging loose in the water. Flowers arising from the margin of the fronds, inclosed, 2 or 3 together, in a membranous spathe. Stamens definite, often monadelphous. Ovary 1-celled, with 1 or more ovules. Stigma 1. Fruit a utricle.

A small order of minute aquatics, of very simple and humble structure. *Lemna* (*Duck-meat*), is our only example.

ORDER CXXII.—Naiadaceæ.

Aquatic plants, with cellular leaves. Flowers inconspicuous, perfect, monœcious, or diœcious. Perianth of 4, distinct sepals, rarely monosepalous. Stamens definite, 4, 2, or 1. Ovaries 1; or else 2—4, free from the perianth, distinct. Stigma simple, often sessile. Fruit 1-celled, 1-seeded, indehiscent.

A very small unimportant order, represented here by *Potamogeton* (*Pond weed*), and *Zostera* (*Wreck-grass*), and a few others.

GROUP II.

ORDER CXXIII.—Alismaceæ.

Marsh herbs, acaulescent. Leaves parallel-veined, but often with reticulated veinlets, sometimes linear and fleshy. Flowers regular, perfect, or monœcious, usually in racemes or panicles. Perianth of 6 sepals, in 2 series. Sepals herbaceous. Petals often colored, sometimes similar to the calyx. Stamens definite, or indefinite. Carpels 3, or more, 1-celled, 1-seeded. Styles and stigmas as many as the carpels.

A very small order, principally represented by *Alisma* (*Water Plantain*), and *Sagittaria* (*Arrow-head*).

ORDER CXXIV.—Hydrocharidaceæ.

Aquatic herbs. Flowers diœcious, or polygamous, regular, arising from a spathe, which is often supported on a scape-like peduncle. Perianth with 6 segments, in 2 series, rarely with 3 in 1 series; in the fertile flowers united below in a tube, which is sometimes very long and slender. Stamens definite, or indefinite. Ovary 1, or 6—9-celled, adherent to the tube of the perianth. Fruit indehiscent.

Unimportant aquatic plants, of which *Vallisneria* (*Tape-grass*), is an example.

GROUP III.

ORDER CXXV.—Orchidaceæ.

Perennial, often acaulescent herbs. Leaves simple, entire, parallel-veined, sometimes wanting. Flowers very irregular. Perianth of 6 segments, all usually colored, and assuming various forms, especially the lowest of the 4 inner segments, or *lip*, which is often spurred. Stamens 3, consolidated with the style into a column, only the central one fertile; sometimes the two lateral

ones fertile, and the central one abortive. Pollen sometimes granular and powdery, but more commonly cohering in wax-like masses, which are usually attached to a gland of the stigma. Ovary twisted, adherent to the tube of the perianth, 1-celled, many-ovuled. Fruit a 3-ribbed, 3-valved capsule.

A very large order, remarkable for its curious and oddly-shaped, but usually very showy, flowers. Many of the tropical species are Epiphytes, as seen in fig. 1, Plate VII. Besides their beauty they have no very remarkable proper-



Fig. 34.

ties. The Salep of commerce is derived from a species of *Orchis*, while the Vanilla of tropical America yields the aromatic seeds, which are so much used



Fig. 35.

as a flavor and perfume. The *Orchis*, fig. 34, *Arethusa*, *Cypripedium* (*Lady's Slipper*), and the *Spiranthes*, fig. 35, are examples.

GROUP IV.

ORDER CXXVI.—Hæmodoraceæ.

Perennial herbs, with fibrous roots. Leaves ensiform, equitant. Perianth woolly, or scurfy, adherent to the ovary, sometimes free, with a regular 6-cleft limb. Stamens 3, or 6, arising from the tube of the perianth. Ovary 3-celled. Anthers introrse. Style 1. Capsule opening by valves, rarely indehiscent.

A very small order of plants, of which *Alettris* (*Star-grass*), is an example.

ORDER CXXVII.—Amaryllidaceæ.

Perennial herbs, arising from bulbs, rarely with fibrous roots. Leaves parallel-veined. Flowers showy, mostly on scapes, and arising from spathes. Perianth regular, sometimes somewhat irregular; tube adherent to the ovary; limb 6-parted. Stamens 6, with introrse anthers, arising from the segments of the perianth. Ovary 3-celled. Style 1. Stigma 3-lobed. Fruit a capsule or berry.

A rather large, chiefly tropical order, distinguished among Endogens by the poisonous character of many of the species. Their bulbs are often acrid and emetic, as in some of the species of *Narcissus*. Those of the *Hæmanthus* are so virulent that the Hottentots use them to poison their arrows. The Jacobean Lily (*Amaryllis*), Jonquil, Daffodil (*Narcissus*), and the Century-plant (*Agave*), are found here.

ORDER CXXVIII.—Iridaceæ.

Perennial herbs, arising from rhizomas, bulbs, or corms, rarely with fibrous roots. Leaves equitant. Flowers often showy, usually arising from a spathe. Perianth-tube adherent to the ovary; limb colored, 6-parted; the divisions usually in 2 obvious, often unequal series. Stamens 3, distinct or monadelphous, with extrorse, 2-celled anthers. Ovary 3-celled. Style 1. Stigmas 3, dilated or petaloid. Capsule 3-celled, 3-valved, with loculicidal dehiscence.

A large order of plants, distinguished more by their beauty than by any active properties. Orris root is the dried rhizoma of a species of *Iris*, native of Southern Europe. The *Iris* (*Blue Flag*, *Fleur de lis*), *Crocus* and *Gladiolus*, are examples.

GROUP V.

ORDER CXXIX.—Dioscoreaceæ.

Twining, often shrubby plants. Leaves alternate, reticulately-veined. Flowers dioecious, or monœcious. Perianth-tube adherent to the ovary; limb with 6 segments, in 2 series. Stamens 6, inserted into the base of the perianth-segments. Ovary 3-celled. Cells 1—2-ovuled. Styles nearly distinct.

A small tropical order, possessing no remarkable properties. Their roots are tuberous, and those of the Yam (*Dioscorea*), containing starch, are edible and highly nutritious. One species of *Dioscorea* is native.

ORDER CXXX.—Smilacaceæ.

Herbs, or shrubs, often climbing. Leaves reticulately-veined. Flowers dioecious. Perianth free from the ovary, 6-parted, regular. Stamens 6, inserted at the base of the segments. Ovary 3-celled. Fruit a globular, few or many-seeded berry.

A small, mostly unimportant order. The official Sarsaparilla is derived from several S. American species of *Smilax*, a genus of which we have a few native species.

ORDER CXXXI.—Trilliaceæ.

Herbs. Stems simple. Roots tuberous. Leaves verticillate, reticulately-veined. Flowers often large, solitary, perfect. Perianth of 6 segments, usually in 2 differently colored series. Stamens 6. Anthers linear. Ovary free from the perianth, 3-celled. Styles distinct. Ovules many, in 2 rows. Fruit a 3-celled berry.

A very small order, represented here by *Medeola* (*Cucumber-root*), and *Trillium*.

GROUP VI.

ORDER CXXXII.—Liliaceæ.

Herbs, arising from bulbs or tubers, rarely with fibrous or fascicled roots. Leaves simple, sheathing, or clasping at base. Flowers regular, perfect, often showy. Perianth with 6, rarely 4, equal, usually colored segments, free from the ovary. Stamens 6, rarely 4, inserted on the segments of the perianth. Anthers introrse. Ovary 3-celled. Styles united into 1. Stigma simple, or 3-lobed. Fruit capsular, with several, or many seeds in each cell.

A large and widely-spread family containing many beautiful and splendid ornamental plants. Their bulbs also are sometimes esculent, as in the Onion and Garlic (*Allium*). Sometimes a bitter principle, with which the whole order abounds to a greater or less extent, is developed so much as to render the



Fig. 36.

bulbs valuable in medicine, as in the Squill (*Scilla*). From the concrete juice of different species of Aloe, we have the drug which is known by their name. The Lily (*Lilium*), fig. 36. Day Lily (*Heimerocallis*), the Lily of the Valley (*Convallaria*), and the Hyacinth (*Hyacinthus*), are examples of this truly noble order.

ORDER CXXXIII.—Pontederiaceæ.

Aquatic herbs. Flowers solitary, or spicate, arising from a spathe, or from a fissure in the petiole. Perianth tubular, 6-cleft, persistent and withering, colored, often irregular. Stamens 3, inserted on the throat of the perianth; or 6, and variously attached to the perianth. Ovary 1—3-celled. Style 1. Stigma 1. Capsule 3-valved, 1 or many-seeded.

An order of aquatic plants, often with showy flowers. Pontederia (*Pickerei-weed*), is an example.

ORDER CXXXIV.—Melanthaceæ.

Perennial herbs, arising from bulbs or rhizomas, corms, or fasciculated roots. Stem simple, often a mere scape. Flowers perfect, or, by abortion, polygamous. Perianth regular, 6-parted; the divisions in 2 series, distinct, or united at base. Stamens 6. Anthers extrorse. Ovary 3-celled, each cell with 3 or more ovules. Styles, or stigmas, 3, distinct. Fruit a 3-celled berry, or capsule.

A small order, distinguished by its violently acrid and poisonous qualities. These properties are peculiarly developed in Colchicum (*Meadow-Saffron*), and Veratrum, both of which are valuable in medicine. One species of Veratrum is our most common native example.

ORDER CXXXV.—Juncaceæ.

Herbaceous plants, generally coarse and grass-like, often leafless. Flowers usually greenish, small, dry, glumaceous, in cymose clusters. Leaves fistular, or else flat, often channelled, sometimes none. Perianth regular, in 2 series of 3 segments in each. Stamens 6, or 3. Ovary 3-celled, or 1-celled, because the placentæ do not reach the axis. Styles united into 1. Stigmas 3. Capsule 3-valved.

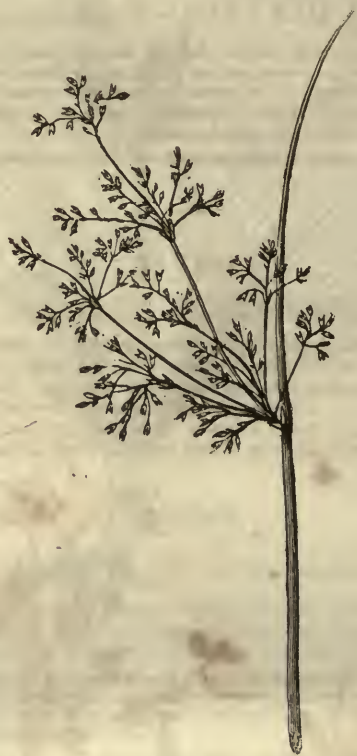


Fig. 37

Juncus the Rush, one species of which is represented in fig. 37, is an example of this family of Rushes.

GROUP VII.

ORDER CXXXVI.—Commelynaceæ.

Herbs with flat, narrow leaves, usually sheathing at base. Perianth with 6 segments in 2 series, the outer 3 herbaceous sepals, the inner 3 colored petals. Stamens 6, or fewer. Anthers with 2 separated cells. Filaments often covered with jointed hairs. Ovary 2—3-celled. Styles united into 1. Stigma 1. Fruit a 2—3-celled, few-seeded capsule, opening by loculicidal dehiscence.

A small and unimportant order, containing many ornamental plants. Tradescantia (*Spiderwort*), is a well-known example.

ORDER CXXXVII.—Xyridaceæ.

Sedge-like herbs. Leaves linear, or ensiform. Flowers in heads, at the summit of a scape. Perianth of 6 segments, in 2 series. Sepals 3, glumaceous, caducous. Petals 3, unguiculate, united into a tube below. Stamens 6, inserted on the corolla, 3

barren, 3 with extrorse anthers. Ovary 1-celled, with 3 parietal placentæ; or 3-celled. Styles 3, partially united. Stigmas lobed. Capsule many-seeded.

A small and chiefly tropical order, represented here by several species of *Xyris* (*Yellow-eyed Grass*).

GROUP VIII.

ORDER CXXXVIII.—Eriocaulonaceæ.

Perennial, aquatic herbs. Leaves linear, spongy, sheathing at base. Flowers monœcious, or dioecious, in dense, hemispherical heads. Perianth 2—6-parted, or wanting. Stamens 6, either all perfect, or some of them abortive. Anthers 1-celled. Ovary either 1 or more-celled; cells 1-seeded.

A very small, chiefly S. American order, of which *Eriocaulon* (*Pipewort*) is an example.

GROUP IX.

ORDER CXXXIX.—Cyperaceæ.

Herbs, usually perennial, coarse, grassy, cæspitose plants. Culms usually solid, without joints or nodes, mostly triangular. Leaves with entire sheaths, sometimes wanting. Flowers solitary, each in the axil of a glume-like bract. Perianth wanting, or else reduced to mere bristles. Stamens usually 3, sometimes 2, or 1. Styles 2—3, more or less united. Fruit an achenium.

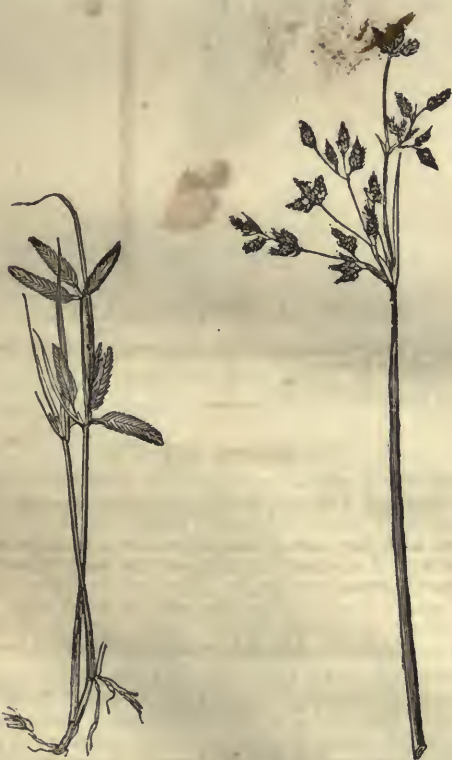


Fig. 38.

Fig. 39.

A very large order of coarse grass-like unimportant plants, growing in wet places and swamps throughout the world, but most abundantly in the cooler portions. They are applied to very few uses, notwithstanding their abundance,

and though cattle feed on them, they afford little nutriment. *Cyperus dianthus*, fig. 38, *Scirpus lacustris*, fig. 39, and *Carex tentaculata*, fig. 40 are illustrations of the more abundant forms.



Fig. 40.

ORDER CXL.—Gramineæ.

Perennial herbs with fibrous roots, rarely arising from bulbs, sometimes annual or biennial. Culms cylindrical, usually fistu-



Fig. 41.

lar, closed at the nodes, sometimes solid. Leaves entire, usually narrow, alternate, with the sheath split from one node down to

the next, usually with a membranous ligule between the base of the leaf and sheath. Flowers in spikes, racemes or panicles, usually perfect, in 1-many-flowered spikelets, composed of glume-

a pair of palea, so that each spikelet has four palea, two of which are, in this case, awned. In fig. 47 is represented *Elymus Virginicus*, a native example of the tribe to which the Wheat, Rye, and Barley belong.



Fig. 42.



Fig. 47.



Fig. 45.

like bracts in 2 rows. Outer bracts (*glumes*), 2, rarely 1, often unequal; the inner 2 immediately inclosing each flower (*palea*), alternate. Perianth none, or consisting of very small, membranous scales (*squamulae*). Stamens 1—6, commonly 3. Anthers versatile. Ovary 1-celled. Styles 2. Stigmas 2, feathery. Fruit a caryopsis.



A very large and most important order, diffused through all parts of the world in the greatest abundance. The herbage furnishes food for cattle and other herbivorous animals, while their seeds, known as the Cereal Grains, form the most important article of human sustenance. None are poisonous, except a single species, the Darnel Grass (*Lolium*). The poisonous properties of Ergot are caused by a parasitic fungus. The stems of many of the species afford sugar, which is most abundant in the different

species of Sugar-Cane (*Saccharum*), and is found also in the Indian Corn (*Zea*). Among the grains, the most important are the Oat (*Avena*), fig. 41, the Wheat, Rye, Rice, Barley, and Malze. The most valuable kinds for grazing purposes are *Agrostis* (*Red-top*), *Phleum* (*Timothy Herd-grass*), and other meadow and pasture Grasses comprising especially various species of *Poa* and *Festuca*. In fig. 42 is represented *Eragrostis megastachya*, illustrating one of the most common forms of Grasses. In fig. 43 we have a many-flowered, awnless spikelet of a *Glyceria*; and in fig. 44, a many-flowered spikelet of *Bromus*, with awned palea. *Panicum latifolium*, fig. 45, is a representative of another tribe, whose peculiar structure is well illustrated in the spikelet of *Panicum Crus-Galli*, fig. 46, where we have two flowers, one of which only is complete, the other being reduced merely to



Fig. 44.



Fig. 46.

latifolium, fig. 45, is a representative of another tribe, whose peculiar structure is well illustrated in the spikelet of *Panicum Crus-Galli*, fig. 46, where we have two flowers, one of which only is complete, the other being reduced merely to

SERIES II.—CRYPTOGAMIA.

Plants without proper flowers, containing stamens and pistils, not reproduced by proper seeds containing an embryo, but by spores or reproductive cells.

CLASS III.—ACROGENS.

Plants with a regular axis of growth, distinguished more or less into root and stem, and usually into leaves also; their structure made up of woody and cellular tissues, and the various vessels found in higher plants; the axis increasing in height and not in diameter, and all growth taking place at the terminal bud of the stem or branch.

ORDER CXLI.—Equisetaceæ.

Leafless plants, with jointed, grooved stems, either simple, or with verticillate branches, which are hollow and closed at the joints, each terminating in a dentate sheath. Inflorescence a dense, cylindric, terminal spike, or strobile, composed of peltate, hexagonal scales; each scale with several thecæ or spore-cases attached to its under surface, opening longitudinally. Spores numerous, with 4 elastic threads, called elaters, wrapped round them.

An order consisting of a single genus, *Equisetum* (*Scouring Rush*, *Pipes*, *Horsetail*), found in damp grounds in all parts of the world.

ORDER CXLII.—Filices.

Leafy plants with perennial, creeping rhizomas, rarely, in the tropics, arborescent, with the leafy expansions (*fronds*) usually circinate in vernation. Inflorescence arising on the margins of the under or back part of the frond, which is sometimes leafy,



Fig. 43.

and sometimes contracted and racemose, or spike-like. Sporangia 1-celled, opening variously, often collected in sori, or fruit-dots, which arise from the veins or margins of the frond, and often covered by an involucre, or indusium.



Fig. 49.

A very large order of flowerless plants, distinguished usually by their elegant and graceful forms. One of the beautiful Tree Ferns of the Tropics is represented in fig. 43, while the humbler forms of the Temperate Zones are

illustrated by *Asplenium Filix femina*, fig. 49, and by *A. ebeneum*, fig. 50. In fig. 49, a segment of the frond, with the sori, is also represented.



Fig. 50.

ORDER CXLIII.—Lycopodiaceæ.

Plants with creeping, or erect leafy, and usually branching stems. Leaves crowded, lanceolate, or subulate, 1-nerved. Thecae sessile in the axils of the leaves, which sometimes take the form of bracts, and are crowded into a kind of spike, or ament, 1, rarely 2 or 3-celled, dehiscent, either containing minute powdery grains, or else a few large sporules; sometimes both kinds are found in the same plant.

The various species of *Lycopodium* (*Club-mosses*), are examples of this small and unimportant order.

CLASS IV.—ANOPHYTES.

Plants consisting almost entirely of cellular tissue, but usually distinguishable into a stem and distinct leaves, and displaying a regular axis of growth; sometimes, however, they take the form of a flat, veiny, green, somewhat leaf-like expansion. Organs of reproduction contained in distinct organs distantly resembling flowers, rarely immersed in the frond.

ORDER CXLIV.—Musci.

Low plants with a stem and distinct sessile leaves, producing sporangia, which are usually covered by a terminal lid, and a kind of hood, called a calyptra, which separates from the stalk at base. A common form of Moss is seen in fig. 20, Plate III., and the capsule with its calyptra and its porous summit, by which it scatters the spores, is well represented in fig. 11.

ORDER CXLV.—Hepaticæ.

Frondose or moss-like plants, with a loose cellular, veiny structure, usually procumbent, producing rootlets beneath. Cap-

sule somewhat like that of Mosses, but not opening by a lid, and the calyptra not separating at base, but usually splitting at apex. In fig. 13, Plate III., is seen one of the common forms of the Liverworts. Other forms are flat, veiny expansions, producing sporangia embedded in their fronds.

CLASS V.—THALLOPHYTES.

Plants composed solely of cellular tissue, being made up of congeries of cells, or sometimes of single cells, often arranged so as to form a flat expansion, or thallus, but never distinguishable into any proper root, stem, or leaves, or possessing any proper axis of growth. Reproductive organs usually contained in the substance itself of the plant.

ORDER CXLVI.—Lichenes.

Plants consisting usually of flat, crustaceous expansions, which are sometimes long and narrow. Their fructification is in cups, or shields, called apothecia, which are placed sometimes on the surface of the thallus, or immersed in its substance, or in pulverulent spots scattered over it.

These are always terrestrial plants, growing usually on rocks and the bark of trees. Their most usual forms are illustrated in figs. 9 and 10, Plate III.

ORDER CXLVII.—Fungi.

These are terrestrial parasitic plants, destitute of green color, feeding either on living or dead organic tissues, but unable to manufacture organic matter from inorganic.

They take many forms, such as Rust, Mildew, Smut, and Mould; two highly magnified forms of the latter being shown in figs. 3 and 4, Plate III. The common Mushroom is the type of another section, illustrated by the edible Mushroom, fig. 12, Plate III.

ORDER CXLVIII.—Algæ.

A very large order, or rather class of aquatic, usually marine plants, presenting great diversities of form and structure. While some are microscopic, and consist of but 1 or a few cells aggregated together, others grow to a great size, and show a very distant approach to higher forms. In figs. 1, 2, and 6, Plate III., are seen several of these minute Algæ, while figs. 7 and 8 are examples of higher types.

[NOTE.—The uses of the different accents and the dash, and all the abbreviations which are used in the Flora, are explained in the glossary.]

SERIES I.—PHÆNOGÁMIA.

CLASS I.—EXÓGENÆ.

SUBCLASS I.—ANGIOSPÉRMÆ.

SECTION I—POLYPÉTALÆ.

ORDER I. Ranunculaceæ.—*Crowfoot family.*

SYNOPSIS OF THE GENERA.

* **Cauline leaves opposite.**

1. CLÉMATIS. Petals none. Achenia terminating in long, plumose tails.

** **Acaulescent.**

3. HEPÁTICA. Flowers with an involucre of three obtuse leaves resembling a calyx. Sepals petaloid. Petals none.

7. CÔRTIS. Sepals petaloid, white. Petals minute, yellow.

*** **Caulescent. Petals none.**

2. ANÉMONE. Stem with a whorl of leaves near the middle, forming an involucre. Flowers solitary. Ovaries in dense heads.

4. THALÍCTRUM. Flowers in panicles or umbellate clusters. Leaves compound.

6. CÁLTHA. Sepals large, yellow. Cauline leaves alternate, simple.

**** **Caulescent. Petals present, equal in size.**

5. RANÚNCULUS. Sepals herbaceous. Petals mostly yellow, with a nectariferous scale at the base. Ovaries numerous, separate, in dense heads.

8. AQUILÉGIA. Sepals petaloid. Petals tubular, tapering into long, hollow, nectariferous spurs descending between the sepals. Follicles 5.

11. ACTÆA. Sepals deciduous, flowers in solitary racemes, petals small, white; fruit a globose berry.

12. PÆDŪA. Sepals 5, herbaceous, persistent. Ovaries 2—5, follicles mostly 2.

13. NIGÉLLA. Petals 3-cleft. Follicles 5. Leaves dissected.

***** **Caulescent. Petals and Sepals present, unequal in size.**

9. DELPHINIUM. Lower sepal spurred at base. Petals 4, 2 upper terminating in a spur inclosed in the calyx spur.

10. ACONITUM. Upper sepal largest, vaulted. Petals 5, 3 lower minute; 2 upper terminating in spurs concealed in the vaulted upper sepal.

1. CLÉMATIS.

Sepals 4—8, colored. Petals none. Anthers linear, extrorse. Achenia terminating in long, plumose tails. *Per.*

1. C. Virginiana.

Virgin's Bower.

Stem climbing by its petioles; leaves ternate, smooth; leaflets ovate, somewhat cordate at base, acuminate, dentate; flowers in panicles, axillary, often dioecious, white; sepals pubescent; fruit covered with long hairs, which cause the plant, when in fruit, to appear at a distance as if in bloom. A vine climbing over the bushes, in thickets and low grounds, 10—15 feet long. *Aug.*

2. ANÉMONE.

Involucre distant from the flower, composed of 3 incised leaves. Sepals 5—15, petaloid. Ovaries collected into roundish or oval heads. Achenia mucronate. *Per.*

1. A. nemerösa.

Wood Anemone.

Stem simple, smooth; leaves ternate; leaflets 3—5-lobed; lobes oblanceolate, dentate; involucre of 3 leaves, on short petioles near the top of the stem; flowers solitary, nodding, somewhat campanulate, white, purplish outside;

heads of achenia small, globose. A pretty little plant growing from 3'—6' high, in old woods and thickets. *April—May.*

2. A. Virginiana.

Wind-flower.

Stem pubescent; leaves ternate; leaflets petiolulate, 2—3-cleft, ovate, dentate, pubescent; flowers greenish white, with the sepals pubescent beneath, on long peduncles; heads of fruit $\frac{1}{2}$ ' long, woolly, oblong, cylindrical; stem 2—3 feet high, with a 3-leaved involucre, from which arise 2—4 long, pubescent peduncles. A coarse-looking plant, very different from the foregoing. Pastures and fields. *June—July.*

3. HEPÁTICA.

Involucre resembling a calyx, very near the flower, composed of 3 ovate, obtuse bracts. Sepals petaloid, 6—9 in number, arranged in 2—3 rows. Petals none. Achenia awnless. *Per.*

1. H. trífloba.

Heart Liverwort.

Acaulescent; leaves broadly cordate, mostly 3-lobed, with the lobes entire, smooth, evergreen, on long, hairy petioles; scapes hairy, 1-flowered, flower nodding; involucre resembling a calyx, green, hairy; sepals varying from a bluish purple to nearly white, scarcely as long as the bracts of the involucre, oblong, obtuse. A beautiful little plant growing on wooded hill-sides, and one of the earliest to appear in spring, sometimes peeping out before the snow has entirely gone. *March—April.*

4. THALÍCTRUM.

Sepals 4—5, petaloid, caducous. Petals none. Stamens numerous. Carpels 4—15, tipped with the stigma, falcate. *Per.*

1. T. dioicum.

Very smooth; stem erect; leaves bi- or triternately decomposed; leaflets rhomboidal, obtuse, 3—5-lobed; flowers dioecious or polygamous, green, panicled, with a long peduncle; sepals 5, purplish, obtuse, caducous; stamens of the barren flowers with long filaments and bright yellow anthers; fertile flowers smaller, with 6—8 shorter stamens. A branching green herb, of no beauty, found in rocky woods, 1—2 feet high. *April—May.*

2. T. Cornuti.

Meadow Rue.

Stem erect, branching, smooth; leaves triternate, sessile; leaflets rhomboidal, 2—3-lobed, mostly smooth; flowers in large, terminal, compound panicles, white, small, dioecious or polygamous; sepals white, oblong, caducous; filaments somewhat clavate. A tall plant growing in wet meadows, 3—6 feet high, with very large leaves, and a hollow rounded stem. *June—July.*

3. T. anemonoides.

Rue Anemone.

Stem low, simple, smooth; radical leaves biternate, on long petioles; leaflets rhomboidal, 2—3-lobed; stem leaves 3, ternate, nearly sessile, verticillate, resembling an involucre; leaflets nearly sessile; flowers much larger than those of the other species, 3—6, in a terminal umbel; sepals 6—10, oval, white, sometimes tinged with purple, not caducous. The root consists of 4—6 oblong

tubers. A delicate little plant with the habit of an *Anemone*, growing in woods and pastures. *April—May*.

5. RANUNCULUS.

Sepals 5. Petals 5, with a nectariferous scale or glandular spot at the base of each petal inside. Stamens indefinite. Achenia ovate, pointed, compressed, crowded into heads. *Per*.

1. *R. Cymbalaria*.

Sea Crowfoot.

Stem creeping, rooting at the joints; radical leaves orbicular, on long petioles, crenate; scape 2'—6' high, 2—4-flowered, with a few oval, obtuse, entire bracts; flowers small, bright yellow; petals spatulate, a little longer than the spreading sepals; heads of achenia cylindrical. The smallest species here described. Abundant in salt marshes. *June—July*.

2. *R. abortivus*.

Stem erect, branching, very smooth; radical leaves reniform, crenate, petiolate, sometimes 3-lobed, upper ones 3—5 lobed; lobes oblong; flowers small, yellow; fruit in globose heads; style very short, straight. This species grows 10'—18' high. Damp woods. *May—June*.

3. *R. recurvatus*.

Wood Crowfoot.

Stem erect, hairy; leaves deeply 3-parted, segments ovate, dentate, pubescent, pale green; flowers rather small, greenish yellow; petals narrow, scarcely equal to the reflexed sepals; achenia in globose heads, tipped with the minute, hooked styles. Common in damp woods, and easily distinguished by its pale green color, and its hooked achenia. *June*.

4. *R. Pennsylvanicus*.

Bristly Crowfoot.

Stem erect, branching, rough, with stiff bristles, as also the petioles; leaves clothed with stiff appressed hairs, ternate; leaflets somewhat petiolate, deeply 3-lobed, incised; flowers small, yellow; sepals reflexed, longer than the petals; heads oblong, somewhat cylindrical; achenia tipped with a very short, straight style. A stout, rough-hairy species, 1—3 feet high, with very small flowers. Common in low grounds. *June—Aug*.

5. *R. acris*.

Butter-cups.

Stem erect, branching, often hollow, hairy; leaves generally pubescent, deeply 3-parted; segments deeply incised, divisions of the upper ones linear, becoming smaller, and terminating in nearly entire bracts; flowers large, of a burnished golden yellow; calyx spreading; heads of achenia globose, beak short, recurved. Common every where in meadows, and other damp soils, 1—2 feet high. *June—Sep*.

6. *R. bulbosus*.

Bulbous Crowfoot.

Hairy; stem erect, branching, forming a bulb at base; leaves ternate; segments petiolate, deeply incised; radical leaves petioled, upper ones sessile, and becoming smaller; flowers like the last, with furrowed peduncles and reflexed sepals; heads globose. A very common species in meadows, much resembling *R. acris*, but easily distinguished by the bulb at the base of the stem, and the reflexed calyx; 1—2 feet high. *May—June*.

7. *R. fasciculâris*.

Early Crowfoot.

Root fascicled; stem branching, slender, hairy; leaves ternately-parted, segments narrow, obovate, 2-lobed, dentate; flowers pale yellow, with a spreading, villous calyx, shorter than the petals, which are wedge-obovate, with broad scales at base. The earliest-flowering species. It grows 4'—10' high, in rocky woods. The radical leaves appear somewhat pinnate. *April—May*.

8. *R. repens*.

Creeping Crowfoot.

Stem branching at base, stoloniferous, mostly smooth; leaves on long petioles, tri-foliate, segments deeply 3-lobed, generally smooth; peduncles furrowed; flowers yellow; sepals spreading; stems 1—3 feet long, generally hairy at base, with dark green leaves. Wet grounds. Common. *May—July*.

9. *R. Parshii*.

Floating Crowfoot.

Stem floating, submerged; leaves dissected into capillary segments; emerged ones reniform, 3—5-lobed; flowers large, bright yellow, about 1' above the water; petals broad, about twice as long as the reflexed calyx; heads of achenia globose; styles straight. Grows in stagnant ponds and pools, and is easily distinguished from the following, by its yellow flowers. *June*.

10. *R. aquatilis*.

White Water Crowfoot.

Stem floating, submerged; submerged leaves filiformly dissected, the emerged, when present, 3-parted; flowers rather small, dull white, about 1' out

of water; petals dull white, with yellow claws. A variable species, growing in stagnant waters. *May—Aug*.

6. CÁLTHA.

Sepals 5—6, resembling petals. Petals none. Ovaries 5—10. Follicles 5—10, compressed, erect, many-seeded. *Per*.

1. *C. palústris*.

Cowslip.

Plant very smooth; stem erect, hollow, dichotomous; leaves reniform, crenate, radical ones on long petioles, those of the stem on short ones; flowers large, bright yellow, pedunculate, in somewhat umbellate clusters of 3—5; sepals nearly or quite orbicular. A showy plant with very bright green foliage, in wet meadows, and much in request for greens in the spring. It is quite variable in the shape of its leaves and sepals. *April—May*.

7. CÓPTIS.

Sepals 5—6 petaloid, deciduous. Petals 5—6. Stamens 15—25. Follicles 5—10, stipitate, somewhat stellately diverging, 4—8-seeded. *Per*.

1. *C. trifolia*.

Goldthread.

Leaves radical, ternate; leaflets sessile, wedge-obovate, somewhat 3-lobed, crenate-mucronate, coriaceous, smooth, on petioles 1'—2' long; peduncles twice as long, slender, 1-flowered, with a single, minute bract above the middle; flower white, star-like in appearance; petals minute, yellow; stamens white; root very slender, extensively creeping, of a golden yellow. A delicate little plant, growing in bogs, well known by its slender golden roots, from which it derives its popular name. *May*.

8. AQUILÉGIA.

Sepals 5, petaloid, caducous. Petals 5, tubular, extending below into long, spurred nectaries. Follicles 5, erect, many-seeded, tipped with the style. *Per*.

1. *A. Canadensis*.

Columbine.

Stem erect, smooth, branching; lower leaves bi-ternate; leaflets on long petioles, 3-lobed, rhomboidal; flowers large, nodding, scarlet; sepals ovate-oblong, rather longer than the petals; petals with a yellow tube above, scarlet below, each with a straight spur filled at the base with honey; stamens and style exsert, yellow. A much more delicate and beautiful plant than the cultivated species, growing 1—2 feet high, in the clefts of rocks. *May*.

2. *A. vulgaris*.

Garden Columbine.

Stem erect, stouter than the last, branching, leafy; leaves mostly smooth, glaucous, bi-ternate; leaflets 2—3-lobed, lobes rounded; flowers large, varying from dark purple to lilac, nodding, with incurved spurs, 1—2 feet high. Native of Europe, cultivated in gardens. *June*.

9. DELPHÍNIUM.

Sepals 5, deciduous, petaloid, irregular; the upper spurred at base. Petals 4, irregular; the 2 upper with a spur-like appendage at base, inclosed in the calyx-spur. Ovaries 1—5.

1. *D. Consólida*.

Larkspur.

Stem erect, smooth, with divaricate branches; leaves palmately divided into very fine capillary segments; flowers few, in loose racemes, generally blue, but varying from light purple and blue to white, often double; pedicels longer than the bracts; carpels smooth. Cultivated in gardens, and sparingly naturalized along road-sides. *July—Aug*.

2. *D. exaltátum*.

Tall Larkspur.

Stem erect, glabrous below, pubescent near the summit; leaves deeply 3—5-parted, lobes cuneiform, divaricate, 3-cleft, acuminate, the lateral ones often 2-lobed; petioles not dilated at base; racemes straight; flowers large, of a rich purplish blue. Native of the Middle States; common in cultivation. *June—Aug*.

3. *D. grandiflorum*. *Large-flowered Larkspur.*

Leaves palmate, many-parted, lobes linear, distant; pedicels longer than the bracts; petals shorter than the calyx; flowers large, double or single, bright blue, with a tinge of purple. Cultivated. *July*. *Per*.

4. *D. elátum*.

Bee Larkspur.

Stem tall, pubescent; leaves 5-lobed, downy; lobes wedge-shaped at base, trifid, dentate; flower large, bluish-purple, appearing at a little distance as if a

bee had alighted in its cavity. A tall species 4–5 feet high, common in gardens. *July–Aug. Per.*

10. ACONITUM.

Sepals 5, petaloid, caducous, upper one large, vaulted. Petals 5, 3 lower ones minute, 2 upper on long claws, expanded into a sac, or short spur at the summit, concealed beneath the galea. *Per.*

1. A. Napéllus. *Monk's Hood.*

Stem straight, erect; leaves deeply 5-cleft; leaflets pinnatifid, segments linear, entire, furrowed above; upper sepal arched at the back; ovaries smooth; flowers large, dark blue, in long racemes. Marked by the broad, vaulted upper sepal, somewhat resembling a monk's cowl. Plant 4 feet high, in gardens. *Aug.*

11. ACTÆA.

Sepals 4–5, roundish, deciduous. Petals 4–8, spatulate. Stamens indefinite. Anthers 2-lobed, introrse. Stigma capitate, sessile. Berry globose, with lateral furrows, 1-celled. Seeds many, compressed. *Per.*

1. A. rubra. *Red Baneberry.*

Stem erect, smooth; leaves ternately decomposed; leaflets ovate, serrate, acuminate, smooth; flowers small, white, in a dense hemispherical raceme, pedicellate, followed by red berries on slender pedicels, containing about 11 seeds. An elegant plant, quite common in rocky woods, 1–2 feet high. *May.*

2. A. álba. *White Baneberry.*

Leaves ternately decomposed; flowers white, in oblong racemes; petals truncate; ripe berries milk-white, often tipped with purple, on thickened pedicels which are purple in fruit, though whitish-green at the period of flowering, and are as large as the peduncle. Grows in rocky grounds, often with the last, which it very much resembles in foliage and general appearance, but is a somewhat stouter plant, blossoming a week later. It is easily distinguished when in flower by its oblong racemes, and when in fruit by its white berries with their thick pedicels. *May.*

12. PÆONIA.

Sepals 5, unequal, leafy, persistent. Petals 5. Stamens numerous. Ovaries 2–5. Stigmas sessile, double, persistent. Follicles many-seeded, opening above. *Per.*

1. P. Officinális. *Peony.*

Stem erect, herbaceous, smooth; lower leaves bi-pinnately divided, coriaceous; leaflets ovate-lanceolate, incised; fruit downy, nearly straight; root fasciculate. A splendid garden plant, universally known. Flowers 2'–3' in diameter, generally double, and varying from a rich dark red to a beautiful rose-color, and even a pure white. *May–June.*

13. NIGÉLLA.

Sepals 5, colored. Petals 5, 3-cleft. Styles 5. Capsules 5, follicular, convex. *An.*

1. N. damascéna.

Stem erect, branching, smooth; leaves twice and thrice pinnatifid, very finely dissected; ultimate segments subulate; flowers terminal, solitary, surrounded by a leafy involucre, white or pale blue, often double; anthers obtuse; carpels 5, 2-celled, smooth, united as far as the ends into an ovoid-globose capsule. A common garden flower. *June–Sept. An.*

ORDER II. Magnoliaceæ.—*Magnolia-family.*

1. MAGNOLIA.

Sepals 5. Petals 6–12, caducous. Carpels 1–2-seeded, persistent, forming a strobile-like fruit. Seeds baccate, sub-cordate, suspended by a long funiculus when mature. Trees.

1. M. glauca. *Small Magnolia.*

Leaves oval, smooth, entire, obtuse, glaucous beneath; flowers solitary, 2' in diameter, fragrant; sepals 3; petals obovate, concave, narrowed at base, erect. A small tree, distinguished by its beautiful foliage and flowers, not uncommon in the Middle States, and sometimes found in swamps in New England, especially in Gloucester, Mass. Cultivated as an ornamental tree. *July.*

2. LIRIODÉNDRON.

Sepals 3, caducous. Petals 6. Carpels 1–2-seeded, indehiscent, imbricated in a cone, the apex ending in a lanceolate wing. Trees.

1. L. tulipifera. *Tulip-tree.*

Leaves of a rich dark green, very glabrous, truncate, with 2 lateral lobes, on long petioles; flowers large, solitary, fragrant, terminating the branches, greenish-yellow outside, orange within; sepals oval, concave, veined, at first spreading, afterwards reflexed. A noble tree, growing 60–80 feet high in New England, and larger elsewhere. Often cultivated for ornament. *May–June.*

ORDER V. Berberidaceæ.—*Barberry-family.*

1. BÉRBERIS.

Sepals 6, outer 3 smaller. Petals 6, roundish, with 2 glands at the base of each. Stamens 6; filaments flattened. Stigma orbicular, compressed, sessile. Fruit a 2–3-seeded, oblong berry. Shrubs.

1. B. vulgaris. *Barberry.*

Leaves oval, or obovate, sharply serrate, with mucronate teeth, smooth, growing in clusters, with 8 spines at base; flowers yellow, in axillary, nodding racemes; petals entire; berries oblong, red, very acid. A well-known shrub, growing in sandy soils, along road-sides, and in rocky pastures, 5–10 feet high. The young branches are light grey and punctate; the stamens are very irritable, springing with violence against the pistil, when touched at the base of the filament. *June.*

2. LEÓNITICE.

Sepals 3–6. Petals 6, with nectariferous scales at the base within. Stamens 6. Pericarp membranaceous, 2–4-seeded. Seeds erect, globose. *Per.*

1. L. thalictroides. *Blue Cohosh.*

Very glabrous; leaves bi-ternate and tri-ternate; leaflets nearly ovate, irregularly lobed, oblique at base, terminal one broadest, equally 3-lobed; stem simple, smooth, bearing 2 leaves, lower one tri-ternate, upper bi-ternate; flowers of a greenish-yellow, in small racemose panicles; seeds 2, or 1 by abortion, deep blue, soon bursting the integument of the ripe fruit, and when raised upon their stalks, they resemble berries. Found in woods, growing 1–2 feet high. When it first appears the whole plant is of a purple hue, and the leaves being rolled up together, it somewhat resembles a Fern just springing up. *April–May.*

3. PODOPHÝLLUM.

Sepals 3, caducous. Petals 6–9, obovate. Stamens 9–18. Anthers linear. Ovary ovate, thick, sessile, peltate. Fruit a large, ovoid berry, 1-celled, and tipped with the stigma. *Per.*

1. P. peltatum. *May-Apple.*

Stem, smooth, round, about 1 foot high, bearing at summit 2 leaves, and a nodding flower between them; leaves large, often from 6'–10' in diameter, peltate, often cordate at base, palmately 5–7-lobed; lobes again 2-lobed, and dentate at apex; flower solitary, white, 1'–2' in diameter; petals curiously veined; fruit ovoid, yellowish, sub-acid and eatable when ripe. A peculiar and curious plant of woods and fields. Rare in N. England. Very common in Western N. York, abundantly covering the hill-sides. The barren stems support but 1 leaf, which is very perfectly peltate. *May.*

ORDER VI. Cabombaceæ.—*Water-shield-family.*

1. BRASÉNIA.

Sepals 3–6, colored within, persistent. Petals 3–4. Stamens 18–36. Ovaries 6–18. Carpels oblong, 2, or by abortion, 1-seeded. *Per.*

1. B. peltata. *Water-shield.*

Stem floating, branched; leaves exactly elliptical, and centrally peltate, entire, smooth, often marked with purple beneath, floating on the surface of the water; stem, under surface of the leaves and peduncles, covered with a soft

slimy substance; flowers just rising above the water, dull purple, $\frac{1}{4}$ in diameter. A not uncommon inhabitant of muddy ponds and deep stagnant waters. *July*.

ORDER VIII. Nymphaeaceæ.—*Water-Lily-family*.

1. NYMPHÆA.

Sepals 4—5. Petals and stamens indefinite in number, insensibly passing into each other. Stigma surrounded by rays. Pericarp many-celled, many-seeded. *Per*.

1. *N. odorata*.

White Pond-lily.

Leaves orbicular, cordate at base, entire, smooth, with prominent veins beneath, dark green above, paler beneath, always floating on the surface; petioles semi-cylindrical, very long in deep water; sepals 4, equalling the petals, which are lanceolate, white, often tinged with purple; filaments yellow. This truly beautiful flower, which claims superiority over all our water plants, for combined elegance and fragrance, is common in deep ponds, and slow-moving rivers, where its thick, fleshy, creeping rhizomas are protected from the winter cold. *July*.

2. NUPHAR.

Sepals 5—6, somewhat petaloid. Petals numerous, inserted with the sepals, much smaller, nectariferous on the back. Stamens linear, truncate, inserted with the petals. Stigma surrounded with rays. *Per*.

1. *N. advena*.

Yellow Pond-lily.

Leaves oval, smooth, entire, cordate at base, with an open sinus, on long, semi-terete, spongy petioles; flowers large, dull yellow; sepals 6, 3 outer yellow inside, 3 inner entirely yellow; petals many; stigma 12—15-rayed, with a crenate margin. A rather handsome plant, growing in muddy ponds, and stagnant waters. The leaves are slimy beneath, and lie flat on the surface, when the water is deep, but are larger and erect where it is shallow. *June—July*.

ORDER IX. Sarraceniaceæ.—*Pitcher-plant-family*.

1. SARRACENIA.

Sepals 5, with an involucre of 3 bracts at base. Petals 5, deciduous. Stigma very large, peltate, 5-angled, persistent. Capsule 5-celled, 5-valved, many-seeded. *Per*.

1. *S. purpurea*. *Pitcher Plant, Side-saddle flower*.

Leaves radical, decumbent, with tubular, inflated, gibbous petioles, which are winged on the inside, & a pitcher-form, ending in a broadly cordate, erect lamina, which is hairy on the inside, and makes the mouth of the pitcher. This process, though small compared with the tubular portion, is yet the real leaf of the plant. Scapes 12'—20' high, with a single, large, nodding, dark-purple flower; petals inflected over the stigma. This plant, which is one of the most remarkable of our native species, is not uncommon in wet meadows, where its curious flowers, and still more curious leaves, attract the attention at once of even the common observer. The pitchers are almost filled with water, containing drowned insects. *June*.

ORDER X. Papaveraceæ.—*Poppy-family*.

SYNOPSIS OF THE GENERA.

* *Acaulescent*.

1. *SANGUINARIA*. Petals 8—12. Capsule oblong, pod-like.

** *Caulescent*. *Petals 4*.

2. *CHELIDONIUM*. Flowers yellow. Capsule linear. Plant with a yellow juice.

3. *PAPAVER*. Capsule somewhat obovate, opening by pores beneath the flat stigma.

4. *ESCHSCHOLTZIA*. Calyx mitriform. Flowers yellow. Plants with a colorless juice.

1. *SANGUINARIA*.

Sepals 2, caducous. Petals 8—12. Stamens numerous. Stigma 1—2-lobed, sessile. Capsule oblong, pod-like, 1-celled, 2-valved, many-seeded. *Per*.

1. *S. Canadensis*.

Bloodroot.

Acaulescent; rhizomas creeping, fleshy, tuberous, of a red color, and from these, as from all other parts of the plant, a red juice exudes, on their being broken. Leaves reniform, 3—7-lobed, smooth, crenate, appearing with the flowers, and becoming much larger in the course of the season, somewhat glaucous. Scapes 3'—6' high, 1-flowered; flower about $\frac{1}{4}$ in diameter, white, inodorous, and of brief duration. An elegant and interesting plant of spring, found in moist woods, and along brook-sides. *April—May*.

2. CHELIDONIUM.

Sepals 2. Petals 4. Stamens numerous. Stigma sessile, bifid. Capsule pod-like, linear, 2-valved. *Per*.

1. *C. majus*.

Celandine.

Stem erect, branching, very smooth; leaves pinnate, 5—7-foliate; leaflets ovate, obtusely lobed and incised, smooth, glaucous; terminal leaflet wedge-obovate, pale green; flowers yellow, very fugacious in few-flowered, axillary, pedunculate umbels; sepals orbicular; petals elliptical. A branching pale green weed, common along fences and walls. Every part of the plant is full of a yellow juice, which is sometimes used to destroy warts. *May—Aug*.

3. PAPAVER.

Sepals 2, caducous. Petals 4. Stamens numerous. Style none. Capsule more or less obovate, opening by pores under the broad persistent stigmas. *An*.

1. *P. somniferum*.

Opium Poppy.

Caulescent, plant very smooth and glaucous; leaves clasping, incised and dentate; flowers white, or purple, often double in cultivation; sepals smooth; capsule globose, glaucous; 1—2 feet high, with glaucous foliage and brilliant flowers about 3' in diameter. Every part of the plant, but especially the capsule, yields a white juice, which, hardened in the sun, forms the drug known as Opium. Cultivated, rarely naturalized. *June—July*.

2. *P. rhæas*.

Common Poppy.

Stem branching, many-flowered, hairy; leaves pinnatifid, incised; flowers large, showy. 2'—3' in diameter, of a deep brilliant scarlet, sometimes red or variegated; capsules smooth, nearly globose. A fine species. Cultivated. *June—July*.

4. ESCHSCHOLTZIA.

Sepals 2, cohering by their edges into a mitriform calyx, caducous. Petals 4. Stamens numerous, adhering to the claws of the petals. Stigmas commonly 4, sessile, 2 of them generally abortive. Capsule pod-shaped, cylindrical, 10-ribbed, many-seeded. *An*.

1. *E. Douglássii*.

Eschscholtzia.

Stem erect, branching, leafy, smooth; leaves twice and thrice pinnatifid, smooth, glaucous; flowers large, brilliant, 2' in diameter; torus obovate; calyx ovoid, with short, abrupt acumination; petals bright yellow, with orange spots at base. An elegant annual from California, but common in cultivation. Distinguished by its delicate foliage and showy flowers.

ORDER XI. Fumariaceæ.—*Fumitory-tribe*.

SYNOPSIS OF THE GENERA.

* *Acaulescent*.

1. *DICENTRA*. Petals 4, distinct, 2 outer spurred at base.

** *Caulescent*.

2. *ADLÉLIA*. Petals 4, united into a spongy monopetalous corolla. Plant climbing by petioles.

3. *CORYDALIS*. Petals 4, 1 only spurred at base. Capsule pod-shaped. Plant not climbing.

4. *FUMARIA*. Petals 4, 1 only spurred at base. Capsule a 1-seeded, globose nut. Plant not climbing.

1. *DICENTRA*.

Sepals 2, minute. Petals 4, 2 outer saccate, or spurred at base. Stamens in 2 sets of 3 each. Capsule pod-shaped, 2-valved, many-seeded. *Per*.

1. *D. cucullaria*.

Dutchman's Breeches.

Acaulescent; leaves radical, tri-ternately decomposed, very finely dissected, light green, glaucous beneath; scapes 3'—10' high, smooth, with erect, simple,

racemes; flowers 4—10 in number, white or cream-color, tipped with yellow at summit, somewhat recurved, nodding, with divergent spurs, which are straight, and rather acute; rhizoma producing little red bulbs under ground. An elegant plant, with delicate foliage and curious flowers, growing in woods. Most common in Northern and Western New England and New York. *April—May*.

2. *D. Canadensis*.*Squirrel-corn.*

Acanthescens; leaves tri-ternately decomposed, very finely dissected, dark green above, glaucous beneath; scape 4'—8' inches high, somewhat stouter than the last, 4—8-flowered; flowers pale purple, very obtuse at summit, with short, rounded spurs, oblong, clavate. The creeping rhizoma produces sparingly yellow bulblets. A beautiful plant, equally delicate with the last, but distinguished by its darker foliage, purplish flowers, and shorter spurs. Woods, often growing with the last. *May—June*.

2. *ADLŪMIA*.

Sepals 2, minute. Petals 4, united into a spongy, persistent, monopetalous corolla, bi-gibbous at base, 4-toothed at apex. Capsule pod-shaped, linear-oblong, many-seeded. *Biennial*.

1. *A. cirrhosa*.*Mountain Fringe.*

Stem herbaceous, smooth, climbing by cirrhose petioles; leaves bi-ternately decomposed; leaflets rhomboidal, 2—3-lobed, lobes entire; flowers numerous, in axillary, nodding, racemose clusters, on slender pedicels, pale purple. A most beautiful and delicate biennial vine, climbing 8—15 feet over shrubs and other plants. Native of mountainous districts, but common in cultivation. *June—Aug.*

3. *CORÝDALIS*.

Sepals 2, minute. Petals 4, 1 only spurred at base. Stamens 6, in 2 sets. Capsule pod-shaped, 2-valved, many-seeded.

1. *C. glauca*.*Sea-green Corydalis.*

Stem erect, branching, glaucous, dotted with purple and green spots; leaves bi-pinnately decomposed, glaucous; ultimate segments wedge-shaped, 3-cleft; flowers in erect racemes, large, rose-color and yellow; bracts linear, shorter than the pedicels. An elegant plant, with delicately beautiful flowers, alternately shaded with rose and yellow. Rocky hills. *May. Biennial*.

4. *FUMÁRIA*.

Sepals 2, caducous. Petals 4, unequal, 1 only spurred at base. Fruit a 1-seeded, ovoid, or globose valveless nut. *An*.

1. *F. officinalis*.*Common Fumitory.*

Stem erect, or decumbent, branching; leaves bi-ternately dissected; ultimate segments linear; flowers small, rose-colored, with crimson tips, in loose racemes. Sepals ovate-lanceolate, acute; nut globose, retuse. A pretty little globose plant, naturalized about gardens and in cultivated grounds. *June—Sep.*

ORDER XII. Cruciferae.—Turnip-family.

SYNOPSIS OF THE GENERA.

A. Fruit a silicle.

* **Silicle more or less emarginate at apex.**

1. *CAPSÉLLA*. Silicle triangular, obcordate, compressed; valves carinate.

2. *LEPIDIUM*. Silicle nearly orbicular, flat; valves carinate.

7. *INERIS*. 2 upper petals larger than the 2 lower. Silicle compressed, truncate.

** **Silicle not emarginate at apex.**

3. *COCHLEÁRIA*. Silicle sessile, ovoid-globose; valves ventricose. Flowers white.

4. *CAMELINA*. Silicle somewhat obovate. Valves ventricose. Styles filiform. Flowers yellow.

5. *ALYSSUM*. Silicle oval, or roundish-oval. Valves flat, or somewhat convex at the centre. Flowers white, or yellow.

6. *LUNARIA*. Silicle oblong, or lanceolate, pedicellate. Valves flat. Flowers purplish.

13. *CAKILE*. Silicle 2-jointed, upper portion ovate-ensiform. Plant fleshy. Petals purplish.

B. Fruit a silicle.

* **Flowers white, or purple.**

9. *ÁRABIS*. Sepals erect. Petals with claws. Silique linear. Valves 1-nerved. Cauline leaves alternate.

10. *CARDAMINE*. Sepals somewhat spreading. Silique linear. Valves veinless. Cauline leaves alternate.

11. *DENTÁRIA*. Silique lanceolate. Valves flat, veinless. Cauline leaves opposite, or in whorls.

12. *HESPERIS*. Silique linear, terete, or 4-sided, and somewhat compressed. Stigmas 2, connivent, but not thickened at apex. Seeds smooth, 3-angled.

16. *MATTIOLA*. Silique terete. Stigmas connivent, thickened at apex. Seeds flattish. Plants clothed with dense, hoary pubescence.

** **Flowers yellow.**

8. *BABBÁREA*. Silique linear, somewhat 4-sided. Leaves lyrate pinnatifid.

13. *SISYMBRIUM*. Petals with claws. Silique 4—6-angled, or nearly round. Style very short. Seeds ovate, convex. Leaves runcinate.

14. *CHEIRANTHUS*. Silique round, or compressed. Seeds flat, ovate. Leaves nearly entire.

15. *SINÁPIS*. Sepals erect. Silique nearly round. Valves concave, veinless. Seeds sub-globose.

17. *BRÁSSICA*. Sepals spreading. Silique somewhat compressed. Valves concave, 1-veined. Seeds globose.

19. *RÁPHANUS*. Silique round, valveless, composed of several transversely-united joints. Seeds sub-globose.

1. *CAPSÉLLA*.

Silicles triangular-cuneiform, obcordate. Valves wingless. Cells small, many-seeded. Style short. *An*.

1. *C. Búrša-pastòris*.*Shepherd's-purse.*

Stem erect, furrowed, branching; radical leaves pinnatifid, on short, margined petioles, growing in a flat tuft, upper ones linear-lanceolate, nearly entire, auriculate at base; flowers very small, white, in long racemes, terminating the stem and branches; capsules obcordate, emarginate, pedicellate, on horizontal pedicels, tipped with the short style. A common weed in cultivated grounds, waste places and road-sides, 1—2 feet high. *June—Oct.*

2. *LEPIDIUM*.

Sepals ovate. Petals ovate. Silicles nearly orbicular, emarginate. Valves carinate, dehiscent. Cells 1-seeded. *An*.

1. *L. Virgínicum*.*Wild Peppergrass.*

Stem erect, branching, smooth; leaves linear-lanceolate, dentate, acute, smooth; flowers minute, white, in racemes, terminating the stem and branches; silicle orbicular, emarginate, not winged. In dry fields and road-sides, about 1 foot high. Leaves of a hot, peppery taste, like that of the garden peppergrass. *June—Oct.*

2. *L. sativum*.*Peppergrass.*

Stem smooth, branching; leaves variously divided and cut, smooth; flowers white; silicles orbicular, winged. A common annual, cultivated in gardens for a salad. Stem 1—2 feet high. *July*.

3. *COCHLEÁRIA*.

Calyx equal at base, spreading. Petals entire. Silicles sessile, ovate, globose, or oblong, with ventricose valves. Styles short, or none. *Per*.

1. *C. Armorácia*.*Horse Radish.*

Stem erect, angular, smooth, branching; radical leaves oblong, crenate, on long, channelled petioles; cauline ones long, lanceolate, dentate, or incised, sessile; flowers small, white, in corymbose racemes; silicle elliptical; roots large, fleshy, and very acrid. A well-known garden plant, growing 2—3 feet high. The lower stem leaves are often pinnatifidly cut. A partially naturalized European plant, cultivated in gardens. *June*.

4. *CAMELINA*.

Calyx equal at base. Petals entire. Silicle obovate, or somewhat globose, with dehiscent, ventricose valves. Cells many-seeded. Styles filiform, persistent. Seeds oblong, without margins. *An*.

1. *C. sativa*.*False Flax.*

Stem erect, pubescent, paniculately branched above; leaves lanceolate, sagittate at base, mostly entire, clasping, pubescent, somewhat scabrous; flowers small, yellow, racemose; silicles turgid, obovate-pyriform, tipped with the style. Naturalized in cultivated fields and road-sides, growing 1—2 feet high. *June*.

5. *ALYSSUM*.

Calyx equal at base. Petals entire. Some of the stamens toothed. Silicle orbicular, or oval, with the valves flat, or convex in the centre. *Per*.

1. *A. saxatile*.*Rock Alyssum*.

Stem suffrutescent at base; leaves lanceolate, entire, downy; flowers numerous, in dense, corymbose clusters; silicle ovate-orbicular, 2-seeded; seeds with margins. An early-flowering perennial, in gardens. *April—May*.

2. *A. maritimum*.*Sweet Alyssum*.

Stem suffrutescent, and procumbent at base; leaves linear-lanceolate, somewhat hoary; flowers small, white, fragrant; pods oval, smooth. Gardens. *June—Oct*.

6. LUNARIA.

Sepals somewhat bi-saccate at base. Petals nearly entire. Silicles pedicellate, elliptical, or lanceolate. Valves flat.

1. *L. rediviva*.*Satin-flower*.

Pubescent; stem erect, branching; leaves ovate, cordate, petiolate, mucronately serrate; flowers light purple; silicles lanceolate, narrowed at each end. A garden plant, 2—3 feet high. *June. Per.*

2. *L. biennis*.*Honesty*.

Pubescent; stem erect; leaves cordate, with obtuse teeth; flowers lilac-colored; silicles oval, obtuse at both ends. A garden plant, 3—4 feet high. *May—June. Biennial*.

7. IBERIS.

The 2 outside petals larger than the 2 inner. Silicles compressed, emarginate; cells 1-seeded. *An.*

1. *I. umbellata*.*Purple Candy-tuft*.

Stem herbaceous, smooth; leaves linear-lanceolate, acuminate; lower ones serrate; upper ones entire; flowers purple, terminal, in simple umbels; silicles umbellate, acutely 2-lobed. A common plant in gardens, growing 1 foot high. *June—July*.

2. *I. amara*.*White Candy-tuft*.

Stem smooth, herbaceous; leaves lanceolate, acute, somewhat dentate; flowers white, corymbed, becoming racemose; silicles obcordate, narrowly emarginate. Equally common with the last. 1 foot high. *June—July*.

8. BARBAREA.

Sepals nearly equal at base. Silique 4-sided; valves concave, carinate. Seeds in a single series.

1. *B. vulgaris*.*Winter Cress*.

Stem smooth, furrowed, branching above; lower leaves lyrate; the terminal lobe roundish; upper ones obovate, pinnatifid at base, crenate, or repandly dentate; flowers small, yellow, in terminal racemes, pedicellate; silicles obtusely 4-angled, slender, curved upward. Brook-sides and damp fields. Plant 1—2 feet high, dark green. *May—June*.

9. ARABIS.

Sepals erect. Petals entire, with claws. Silique linear, compressed, valves 1-nerved in the middle. Seeds in a single row in each cell.

1. *A. Canadensis*.*Sickle-pod*.

Stem slender, simple, smooth, sometimes pubescent below; leaves oblong-lanceolate, narrowed at each end, with few teeth, or entire, generally pubescent, sessile; lower ones narrowed to a petiole, sometimes withering early; flowers small, white, racemose; silicle falcate, pendulous, tipped with the style. Distinguished by the long, pendent pod, which, though nearly straight at first, afterwards assumes the form of a cutlass blade. Rocky woods. *June. Per.*

10. CARDAMINE.

Calyx somewhat spreading. Silique linear. Valves flat, veinless, generally opening elastically. Seeds ovate, without margins, and with slender stalks. Mostly *Per.*

1. *C. hirsuta*.*Bitter Cress*.

Stem erect, branching, mostly smooth; leaves pinnate or lyrate pinnatifid; leaflets of the lower ones oval, of the upper, narrowly oblong,—the terminal longest, 3-lobed; flowers small, white, racemose; silicle long, slender, erect, tipped with a short style. A variable, dark-green plant, common in wet grounds. *June*.

2. *C. rotundifolia*.*American Water-cress*.

Stem erect, simple, smooth; lower leaves ovate, or almost orbicular, with a few large, repand teeth, on long petioles; upper ones varying from spatulate to

lanceolate, entire, or with a few repand teeth, petiolate, or sessile; flowers mostly large, white, in a terminal raceme; silicles long, slender, spreading. An elegant but very variable species, in meadows, 6'—12' high. *April—May*.

A beautiful and strongly-marked variety has the stem erect, simple, hairy; leaves petiolate, somewhat fleshy; the radical ones roundish, cordate, or reniform; cauline ones strongly repand-toothed; flowers large, deep rose-color, or purple. In shady, damp places. W. New York.

11. DENTARIA.

Sepals converging. Silique lanceolate; valves flat, nerveless, opening elastically; placenta not winged. Seeds in a single row, without margins.

1. *D. laciniata*.*Tooth-wort*.

Rhizoma moniliform; stem simple, smooth, with 8 verticillate leaves; leaves 3-parted; lobes varying from lanceolate to linear, incisely toothed, often cut so deep as to appear almost digitate; teeth mucronate; flowers large, purplish-white, in terminal racemes; petals obovate-oblong. A pretty plant, from 6'—12' high in woods. Most common from N. E. westward. *April—May*.

2. *D. diphylla*.*Pepper-root*.

Rhizoma elongated, toothed, with a pungent, aromatic flavor; stem erect, smooth, with 2 opposite ternate leaves about half way up on the stem; leaflets ovate, serrate, acute, smooth, petiolate; flowers large, white, or very pale purple, in a terminal raceme. Not common in S. E. New England; woods and meadows. *May*.

12. HESPERIS.

Calyx closed, furrowed at base. Petals linear or obovate, bent obliquely. Silique nearly round; or 4-sided and somewhat compressed. Stigmas 2, erect, connivent. Seeds somewhat 3-sided, without margins.

1. *H. matronalis*.*Rocket*.

Stem simple, erect; leaves ovate-lanceolate, denticulate, acute, on short, margined petioles, slightly scabrous as well as the stem with scattered, bristly hairs; flowers large, purple, racemed; silicles erect, 2'—4' long, smooth. A garden perennial, growing 3—4 feet high. *May—July*.

13. SISÝMBRIUM.

Sepals equal at base. Petals with claws, entire. Silique somewhat terete; valves concave. Style very short. Seeds ovate. *An.*

1. *S. officinale*.*Hedge Mustard*.

Stem erect, more or less pubescent, very branching; branches spreading; leaves roundate, hairy; the segments mostly at right angles to the mid-vein; flowers in slender, virgate racemes, very small, yellow; silicles sessile, erect, pressed closely to the common peduncle. A common weed in cultivated fields and waste places, growing 1—3 feet high. *June—September*.

14. CHEIRÁNTHUS.

Inner sepals gibbous at base. Silique round or compressed. Stigma 2-lobed or capitate. Seeds flat, ovate, in a single series.

1. *C. Chèiri*.*Wall-flower*.

Stem somewhat snuffrutescent and decumbent at base, with angular branches; leaves lanceolate, entire or slightly toothed, acute, smooth; flowers orange or yellow, large, in corymbose clusters; petals obovate; silicles erect, acuminate. A common garden plant possessing a pleasant fragrance. *June*.

15. SINAPIS.

Calyx spreading. Silique nearly round, with veined valves. Style short, acute. Seeds sub-globose, in a single series. *An.*

1. *S. nigra*.*Mustard*.

Stem erect, smooth, striate, branching, round; lower leaves lyrate; upper linear-lanceolate, entire, smooth; flowers yellow, $\frac{1}{2}$ in diameter, racemose; sepals pale yellow; silicles smooth, somewhat 4-sided, appressed, nearly 1' long; seeds small, globose, nearly black. Cultivated grounds and waste places, growing 3—6 feet high. *June—July*.

16. MATTHIOLA.

Calyx closed. Sepals bi-saccate at base. Silique terete. Stigmas connivent, thickened or carinate on the back.

1. *M. annua*.*Ten-weeks Stock.*

Stem erect, herbaceous, branched; leaves hoary-canescens, lanceolate, obtuse, somewhat toothed; flowers large, variegated; silique, sub-cylindrical. A common garden plant, growing 2 feet high, and clothed with soft stellate pubescence. *June—August.*

2. *M. incana*.*July-flower.*

Stem suffrutescent, erect, branched; leaves hoary-canescens, lanceolate, entire; flowers large, purple, racemose; silique sub-cylindrical, truncate and compressed at apex. Stem 2 feet high. Gardens. *June. Biennial.*

17. BRÁSSICA.

Sepals equal at base. Petals obovate. Silique somewhat compressed, with concave valves and a central vein. Style short, obtuse. Seeds globose. *Biennial.*

1. *B. campestris*.*Ruta-baga.*

Stem round, smooth above, with a few reflexed hairs below; leaves somewhat fleshy and glabrous; the lower lyrate-dentate, somewhat ciliate; upper cordate, clasping, acuminate; flowers large, yellow, in long racemes; silique long, tipped with the long style; seeds small, dark brown. Sometimes naturalized in fields. Roots large, tumid, napiform, inferior to the Turnip.

2. *B. Rapa*.*Turnip.*

Stem and leaves deep green; radical leaves lyrate, rough; lower stem leaves incised; upper entire, smooth, clasping; flowers yellow; seeds small, reddish brown. A variety with enlarged napiform roots is the Round-turnip so common in cultivation as an esculent vegetable, and for feeding stock. *June.*

3. *B. olerácea*.*Cabbage.*

Leaves very smooth, and glaucous, fleshy, repand toothed, or lobed, sub-orbicular; flowers yellow, in paniculate racemes. Native of sea-shores and cliffs in Europe, where it shows no appearance of a head like that of the esculent varieties, thus showing the great power of cultivation. The Cauliflower, Broccoli, as well as the Cabbage, are varieties of this species. *June.*

18. CAKILE.

Silicle 2-jointed; upper part ovate or ensiform. Seeds in the upper cell erect; in the lower, pendulous, often abortive. *An.*

1. *C. marítima*.*Sea Rocket.*

Smooth, succulent; stem very branching, procumbent; leaves oblong, cuneiform, minutely toothed, petiolate; flowers small, pale purple or whitish, pedicellate, in racemes corymbosely arranged; silicle smooth, roundish; lower joint clavate-obovate; upper with 2—3 minute teeth at base marked with an elevated line on each side. A common plant about 6'—12' high, on sea and lake shores. *July—August.*

19. RÁPHANUS.

Calyx erect. Petals obovate. Silique terete, torose, valvless, transversely many-celled. Seeds sub-globose, in a single series.

1. *R. Raphanistrum*.*Wild Radish.*

Stem erect, branching, terete; leaves lyrate; flowers bright yellow, large, racemose; petals spreading, turning white, purple, or blue, as they grow old; Silique round, jointed, 1-celled when mature. Road-sides and fields. New England. *July.*

2. *R. sativa*.*Garden Radish.*

Stem very branching; lower leaves lyrate, petiolate, upper ones dentate; flowers large, white, or tinged with purple; silique torose, round, acuminate, 1'—2' long, scarcely longer than the pedicel. A common garden vegetable 2—4 feet high, different varieties of which produce the various kinds of radishes. *June—August.*

ORDER XIII. Capparidácea.—Caper-family.

1. CLEOME.

Sepals distinct or somewhat united at base. Petals 4. Torus minute or nearly round. Stamens 6, rarely 4. Pod sessile or stipitate.

1. *C. púngens*.*Spiderwort.*

Glandular-pubescent; stem simple, smooth, the petioles prickly; leaves digitate, 5—9 foliate, long-petiolate; leaflets elliptical-lanceolate, acute at each end, slightly toothed; flowers purple, racemed; sepals distinct; petals on filiform claws; stamens 6, twice as long as the petals. A common garden flower growing 4 foot high, chiefly remarkable on account of the curious structure of the flowers. *July—August.*

ORDER XIV. Resedácea.—Mignonette-family.

1. RESEDA.

Sepals many. Petals equal in number, each bearing 1 or more stamens. Torus large, fleshy, bearing the ovary with several stamens and styles.

1. *R. odoráta*.*Mignonette.*

Leaves 3-lobed, or entire; sepals shorter than the petals. A plant too widely known and admired for its unsurpassed fragrance to need description. *An.*

ORDER XV. Violácea.—Violet-family.

1. VIOLA.

Sepals 5, unequal, auriculate at base. Petals 5, irregular, the lower one spurred at base; the two lateral ones equal, opposite. Stamens approximate; filaments distinct, dilated at base. Capsule 1-celled, 3-valved. Perennials, with 1-flowered peduncles. The spurred petal, which is really the upper one, appears to be the lower, on account of the reversed position of the flower

* *Acaulescent.*1. *V. cuculláta*.*Hooded Violet.*

Leaves cordate, crenate, often cucullate at base, generally smooth; flowers of a fine blue, large, marked with dark lines; stipules linear; stigma triangular, margined; lower petals bearded. One of the most common species, growing every where in meadows and wet ground, and sometimes even in dry soils, where it is pubescent. *May.*

2. *V. sagittáta*.*Arrow-leaved Violet.*

Leaves sagittate, more or less pubescent, serrate or crenate; flowers rather small, on peduncles, which are usually longer than the leaves, deep purplish blue, with a short, obtuse spur; petals veiny, white at base; lower and lateral ones densely bearded. A variable species with deep blue flowers. *May.*

3. *V. ováta*.*Ovate-leaved Violet.*

Leaves ovate, pubescent, crenate, rarely cut at base, on short petioles, nearly prostrate; flowers of a deep purplish blue, on short peduncles, with a short, rounded spur; sepals, ciliate, oblong-ovate, deeply emarginate behind; petals entire, veined; lateral ones bearded. Very common. Dry hills. *May.*

This species has been considered a variety of the last; but it is well marked by the shape and position of its leaves and its early appearance.

4. *V. palmáta*.*Palmate Violet.*

Pubescent; leaves palmate, or hastately lobed, rarely entire; lobes crenate, and dentate; middle one much the largest; flowers of medium size, bright blue; petals veined, white at base; upper ones smaller; lateral ones bearded. A variable species. Uplands. The leaves vary in form and pubescence, the earlier ones being nearly or quite entire, ovate, cordate at base. *May—June.*

5. *V. pedáta*.*Bird-foot Violet.*

Nearly smooth; root perennate; leaves pedate, 5—7 parted; segments linear-lanceolate, entire or 3-parted; flowers large, of a rather pale, but very brilliant blue, rarely white; petals white at base, beardless; stigma large and thick, margined, obliquely truncate, very short, restrate. A very distinct and handsome species. Borders of dry woods, and sandy fields. *April—May.*

6. *V. odoráta*.*Sweet-scented Violet.*

Stolons creeping; leaves cordate, crenate, nearly smooth; flowers large, fragrant, of a brilliant bluish purple, in cultivation frequently double; sepals obtuse; stipules lanceolate, toothed; peduncles branched; petals with a hairy

line. An English species cultivated in gardens, and well known by its exquisite fragrance. A variety has white flowers. *April—May.*

7. *V. blanda.* *White Violet.*

Leaves cordate, slightly pubescent, crenate, on short, slightly pubescent petioles; flowers small, white, on scapes longer than the leaves, slightly fragrant; rhizoma creeping; petals marked with blue lines, greenish at base, mostly beardless. Meadows; common. *May.*

8. *V. lanceolata.* *Lance-leaved Violet.*

Leaves lanceolate, slightly crenate, erect, on rather long petioles, attenuate at both ends; scapes 4-sided, bracteolate, longer than the leaves; flowers small, white; petals greenish at base, marked with blue lines, generally beardless. Often growing with the last in wet meadows. Common. *May.*

9. *V. rotundifolia.* *Round-leaved Violet.*

Leaves large, orbicular-ovate, cordate at base, nearly smooth, crenate, with a closed sinus and pubescent petioles; flowers small, pale yellow; stigma recurved at apex, margined; petals marked at base with brown lines; lateral petals bearded; sepals obtuse. A small species with small, yellow flowers, sometimes found in old woods, and on densely wooded hill-sides. *May.*

*** Caulescent.*

10. *V. Canadensis.* *Canadian Violet.*

Stem nearly purple; radical leaves reniform; cauline ones cordate; all serrate, nearly or quite smooth, with pubescent veins; flowers of medium size, pale blue or white; stipules ovate-lanceolate, entire; peduncles shorter than the leaves; petals yellowish at base; upper ones purple outside, paler within, and marked with purple lines; lateral ones bearded. A common violet in mountainous districts, growing in woods, 6'—12' high. *May—June.*

11. *V. pubescens.* *Large Yellow Violet.*

Stem erect, pubescent; leaves broad, cordate, often almost triangular in outline, obtuse, toothed, covered with a soft, thick pubescence; stipules ovate, subdentate; flowers rather large, yellow; lateral petals bearded; upper ones marked with brown lines; peduncles pubescent, shorter than the leaves; sepals oblong-lanceolate; spur very short, subgibbous. A fine violet with yellow flowers, growing in rich woods, 3'—6'. Common. It is very variable, especially in height and pubescence, being often nearly smooth. *May—June.*

12. *V. Muhlenbergii.* *Spreading Violet.*

Stem weak, assurgent, branching at base; leaves reniform or cordate, crenate; upper ones somewhat acuminate, petiolate, with incisely ciliate stipules; flowers pale blue, medium size, with conspicuous spurs; peduncles axillary, longer than the petioles, with 2 alternate bracts on the upper portion; stigma tubular, pubescent; spur very obtuse. A pretty species, of slender habit, in swamps and low grounds. *May.*

13. *V. tricolor.* *Pansy.*

Stem angular, diffuse; leaves ovate, obtuse; lower ones ovate-cordate, crenate, petiolate; stipules lyrate, very large, the terminal segment equalling the leaves, crenate; flowers large, on long axillary peduncles; 2 upper petals of a rich velvet-like purple; the 2 lateral ones pale straw color, and with the yellow lowest one marked with purple lines; spur thick, obtuse, very short. A beautiful and very variable species, cultivated in gardens. It begins to bloom early in spring, and continues until winter.

ORDER XVI. *Droseraceæ—Sundew-family.*

1. *DROSERA.*

Sepals 5, united at base, equal, persistent. Petals 5. Stamens 5. Styles 3—5, 2-parted. Capsule subglobose, ovoid, 3-valved, 1-celled, many-seeded. *Per.*

1. *D. rotundifolia.* *Sundew.*

Leaves radical, in tufts, orbicular, on long petioles, lying flat on the ground, covered with long, reddish, curving, glandular hairs; scapes circinate when young, racemose, somewhat 1-sided; flowers small, white; the scape at first coiled inward, but unwinding as it flowers, it becomes erect in seed. Marshes. *Aug.*

2. *D. longifolia.* *Long-leaved Sundew.*

Leaves obovate or spatulate, on long, smooth petioles, covered with hairs, as in the other species; flowers small, white, in few-flowered, somewhat recurved

racemes like those of the last, from which it is distinguished by the form of the leaves, and its more slender habit. A beautiful little plant, the glandular hairs with which it is so thickly clothed, collect drops of water, giving it the appearance of being sprinkled with pellucid dew-drops. *June—Aug.*

2. *PARNASSIA.*

Sepals 5, persistent, united at base. Petals 5, persistent nearly perigynous. Stamens perigynous, in 2 series; outer indefinite in number, arranged in 5 groups, sterile; inner series consisting of 5 perfect ones, alternating with the petals. Capsule 1-celled, 4-valved. Seeds numerous, with a winged testa. *Per.*

1. *P. Caroliniana.* *Grass of Parnassus.*

Acaulescent; leaves on long, channelled petioles, orbicular-ovate, strongly veined, entire, light green, somewhat coriaceous; scapes 4-angled, generally with a sessile leaf just below the middle; flowers solitary, large, white, nearly 1' in diameter; sterile filaments in 5 clusters of 5 each, distinct almost to the base; petals much larger than the calyx, oval, beautifully veined with a light dull green. A common and very elegant plant. Wet meadows. *July—Aug.*

ORDER XVII. *Cistaceæ—Rock-Rose-family.*

1. *HELIANTHEMUM.*

Sepals 5; the 2 outer ones much smaller. Petals 5, or rarely 3, sometimes wanting, fugacious. Stamens numerous. Stigmas 3, more or less united. Capsule triangular, 3-valved, 3, or many-seeded. *Per.*

1. *H. Canadense.* *Rock-Rose.*

Stem erect, mostly simple, pubescent; leaves oblong, entire, usually alternate, acute, paler beneath; flowers of 2 kinds, the earlier ones large, few, bright yellow, fugacious, terminal; petals large, thin, nearly orbicular, emarginate, twice as long as the calyx; later ones apetalous, or with very small petals, axillary, sessile, nearly solitary, very small; capsules smooth, shining; those of the apetalous flowers very small. A handsome plant in its first bloom, about 1 foot high, with large yellow flowers, which appear in June; but during the rest of the summer it puts forth minute apetalous flowers, and then much resembles *Lechea major*.

2. *LECHÆA.*

Sepals 5; 2 outer much smaller. Petals 3, lanceolate, small. Stamens 3—12. Stigmas 3, nearly sessile, almost united. Capsule 3-valved, 3-celled. Placentæ each 1—2-seeded. *Per.*

1. *L. major.* *Great Pinweed.*

Stem erect, pubescent, branching; branches villous; radical ones prostrate; leaves mostly alternate, oblong, mucronate, hairy; flowers small, dull purple, numerous, in irregular, leafy racemes, inconspicuous, followed by a small fruit, rather larger than a pin-head. A rigid, erect plant, in dry fields, growing 10'—20' high, with a brittle purplish stem. The root sends out prostrate branches, which last through the winter, and are thickly covered with nearly round tufted leaves. *July—Aug.*

2. *L. thymifolia.* *Long-leaved Pinweed.*

Stem decumbent at base, very branching, pubescent, often of a dull purple; leaves very numerous, frequently verticillate; cauline ones oblanceolate, or oblong-linear, those of the stem branches much smaller, linear; those of the radical branches imbricated, elliptical; flowers numerous, in axillary and terminal clusters of 3 or 4, followed by minute, globose fruit. Sandy fields near the coast. *July.*

3. *L. minor.* *Small Pinweed.*

Stem erect, nearly smooth, very branching; radical branches procumbent, hairy, often none; leaves linear; those of the stem often nearly oblong, scattered, sometimes verticillate; flowers dull purple, in nearly simple racemes, separate, pedicellate; capsule globose. A delicate species in dry grounds, 3'—5 high, with flowers and fruit twice as large as in *L. major*. *June—Sep.*

ORDER XVIII. *Hypericaceæ—St. John's-wort-family.*

1. *HYPERICUM.*

Sepals 5, connected at base, nearly equal, foliaceous. Petals 5, oblique. Stamens numerous, sometimes few, united at base

into 3—5 parcels, occasionally distinct. Styles 3—5, separate, or united at base, persistent.

* *Stamens in several sets.*

1. *H. perforatum.* *St. John's-wort.*

Stem erect, 2 edged, smooth, branching; leaves elliptical, obtuse, sessile, punctate with pellucid dots; flowers numerous, bright yellow, in cymose panicles; leaves lanceolate, much shorter than the obovate petals and sepals, bordered with dark-colored glandular spots. A common troublesome plant, spreading rapidly in pastures and dry grounds. Introduced. *June—July. Per.*

2. *H. corymbosum.* *Spotted St. John's-wort.*

Stem erect, smooth, terete, with opposite branches; leaves oval, sessile, smooth, emarginate, punctate with dark spots; flowers numerous, pale yellow, rather small, in dense, terminal, corymbose cymes; petals oblong, with oblong, dark spots; styles distinct; stigmas red, 2. In wet woods and boggy meadows. Stem 1—3 feet high. *Per.*

** *Stamens distinct.*

3. *H. mutilum.* *Small St. John's-wort.*

Stem erect, smooth, 4-angled, branching above; leaves oval, obtuse, entire, sessile, 5-veined; flowers very small, greenish-yellow, in leafy cymes; sepals lanceolate, a little longer than the petals; stamens 6—12; capsule ovate, conical. A small species in wet grounds. *July—Aug. An.*

4. *H. Canadense.* *Canadian St. John's-wort.*

Stem slender, erect, with the 4 angles marked by the decurrent base of the leaves; leaves linear, attenuate at base, with black dots beneath; flowers small, pale orange, in nearly naked cymes; sepals lanceolate, very acute, longer than the petals, but shorter than the red capsule. A small, delicate species, 8'—12' high, in wet sandy soils. *July—Aug. An.*

5. *H. Sarothra.* *Slender St. John's-wort.*

Stem slender, square, with filliform branches; leaves minute, opposite, subsulate; flowers very small, yellow, sessile; sepals linear-lanceolate, about equal to the petals, $\frac{1}{2}$ as long as the purple, acute capsule. A curious looking plant, in road-sides and dry soils, from the very small size of the leaves, apparently leafless. *July—Aug. An.*

2. *ELODÆA.*

Sepals 5, equal, somewhat united at base. Petals 5, deciduous, equilateral. Stamens in 3 parcels, which alternate with 3 hypogynous glands. Styles 3, distinct. Capsule 3-celled. *Per.*

1. *E. Virginica.* *Marsh St. Johns-wort.*

Stem erect, smooth, sub-compressed, branching; leaves sessile, clasping, oblong, obtuse, glaucous beneath; flowers rather large, of a dull orange purple, in axillary and terminal racemes; petals obovate-oblong, twice longer than the sepals, marked with reddish veins; stamens united below the middle, 3 in a set; glands ovate, orange-colored. Grows 8'—16' high, in swamps and ditches, generally with foliage of a purplish hue. *July—Aug.*

ORDER XX. Caryophyllaceæ.—*Pink-family.*

SYNOPSIS OF THE GENERA.

SUBORDER I. *Sileneæ.*

Sepals united into a tube. Petals with claws. Leaves without stipules. Stamens inserted below the pedicellate ovary.

1. *SILENE.* Calyx without scales at base. Styles 3. Capsule opening by 6 teeth.

2. *LYCHNIS.* Calyx without scales, and entire at base. Styles 5. Capsule opening by 5—10 teeth.

3. *SAPONARIA.* Calyx without scales at base. Styles 2. Capsule 1-celled, opening by 4 teeth.

4. *DIANTHUS.* Calyx with 2 scales at base. Styles 2. Capsule 1-celled.

SUBORDER II. *Alsineæ.*

Sepals nearly or quite distinct. Petals without claws, rarely none. Capsule 1-celled. Leaves without stipules.

* *Petals entire, or none.*

7. *ARENARIA.* Petals 5. Styles 3, rarely 2 or 4. Stamens inserted at the base of the ovary. Flowers perfect.

8. *HONCKENYA.* Petals 5. Styles 3—5. Stamens inserted into a glandular disk. Flowers mostly polygamo-dioecious.

9. *SAGINA.* Petals 4—5. Styles 4—5. Pod 4—5-valved. Leaves setaceous.

** *Petals 2-cleft at apex.*

5. *STELLARIA.* Styles 3—4. Capsule opening by 3—6 valves.

6. *CERASTIUM.* Styles 5. Capsules opening by 10 teeth.

SUBORDER III. *Illecæbreæ.*

Sepals nearly or quite distinct. Petals without claws, or none. Capsule 1-celled. Leaves with scarious stipules.

10. *ANYCHIA.* Petals none. Stamens 2—5. Styles 2, more or less united. Capsule 1-seeded.

11. *SPERGULA.* Petals 5. Stamens 5—10. Styles 3—5. Capsule many-seeded.

SUBORDER IV. *Scleranthææ.*

Sepals united at base, with the stamens inserted at the throat. Petals none. Capsule 1-celled. Leaves without stipules.

12. *SCLERANTHUS.* Stamens 5—10. Styles 2.

SUBORDER V. *Molluginææ.*

Sepals united at base. Petals none. Capsule 3-celled. Leaves without stipules.

13. *MULLIGO.* Sepals 5. Stamens 3—5. Styles 3.

1. *SILENE.*

Calyx tubular, swelling, without scales at base, 5-toothed. Petals 5, unguiculate, often with scales at summit. Stamens 10. Styles 3. Capsule 3-celled, many-seeded, opening at the top by 6 teeth.

1. *S. antirrhina.* *Nocturnal Catchfly.*

Nearly glabrous; stem simple, or branched above, erect, glutinous below each node; leaves lanceolate; upper ones linear, acute and scarious on the margin; flowers small, pale red, nocturnal, also open in very cloudy weather, peduncles few-flowered; flowers pedicellate; petals emarginate; calyx ovate. Dry sandy soils, 8'—20' high. *June—July. Per.*

2. *S. Arméria.* *Garden Catchfly.*

Very glabrous, glaucous; stem erect, branching, glutinous, as in the last; leaves ovate-lanceolate; flowers purple, in corymbose cymes, numerous; petals orbiculate, crowned; calyx clavate, 10-striate. A common garden flower, 12'—18' high. *July—Sep. An.*

2. *LYCHNIS.*

Calyx tubular, 5-toothed, without scales at base. Petals 5, unguiculate; claws slender. Stamens 10. Styles 5. Capsule 1-celled or 5-celled at base.

1. *L. Githago.* *Corn-cockle.*

Stem dichotomous, hirsute; leaves sessile, soft-hairy; flowers few, light purple, on long peduncles; calyx segments twice as long as the entire petals. A handsome weed, 1—3 feet high, in cultivated grounds, especially in grain fields; leaves of a pale green color. *July. An.*

2. *L. Chalcædónica.* *Scarlet Lychnis.*

Nearly smooth; leaves ovate-lanceolate, acuminate, dark green; flowers in terminal, dense fascicles, scarlet; calyx cylindric, ribbed, clavate; petals 2-lobed. Gardens, growing 6' high. Flowers varying to white, sometimes double. *June—July. Per.*

3. *L. Floscuculi.* *Ragged Robin.*

Subglabrous; stem assurgent, dichotomous and viscid above, with scarious angles; flowers fascicled, pink; calyx brown, smooth, 10-ribbed, campanulate; petals deeply cut into 4 linear segments. A beautiful inhabitant of the garden, blooming from July to September. *Per.*

4. *L. coronata.* *Chinese Lychnis.*

Glabrous; stem erect; flowers large, bright red, terminal and axillary 1—3 in number; calyx terete, clavate, ribbed; petals laciniate. Plant 1—2 feet high. Gardens. *July.*

5. *L. diurna.* *English Lychnis.*

Stem erect, pubescent, dichotomous, paniculate above; leaves elliptic-ovate, acute; flowers light purple, dioecious; petals deeply-bifid, with narrow diverging lobes; capsule subglobose. Almost naturalized in some places. Gardens. *July—Sep.*

3. *SAPONARIA.*

Calyx tubular, 5-toothed, without scales. Petals 5, with claws as long as the calyx. Stamens 10. Styles 2. Capsule 1-celled.

1. *S. officinalis*.*Bouncing Bet.*

Plant smooth, somewhat fleshy; leaves oval, or ovate-lanceolate, smooth, sessile, mucronate; flowers large, pale rose color, in paniculate fascicles; calyx cylindrical; crown of the petals linear; flowers often double. Stem 1–2 feet high, square. Common in road-sides and waste places. Introduced. *July–Aug.*

4. *DIANTHUS*.

Calyx tubular, 5-toothed, with 1, rarely with more pairs of opposite, imbricate scales at base. Petals 5, with long claws. Stamens 10. Styles 2. Capsule 1-celled. *Per.*

1. *D. Arméria*.*Wild Pink.*

Stem, smooth, erect, branched above; leaves linear-subulate, hairy, sessile, clasping at base; flowers rather small, scentless, in dense fascicles; calyx scales lanceolate-subulate, as long as the tube; petals red, dotted with white, crenate. The only species found wild in the U. S. It grows in dry fields and road-sides in Eastern N. Eng. Stem 1–2 feet high. *June–Aug.*

2. *D. barbatus*.*Sweet William.*

Stem erect, branching; leaves lanceolate; flowers red, often much variegated, in dense fascicles, rather small; scales of the calyx lanceolate-subulate, equalling the tube. A well-known garden flower, 10'–18' high. *May–July.*

3. *D. Chinénsis*.*China Pink.*

Stem erect, branched; leaves lance-linear; flowers large, red, solitary; scales linear, leafy, spreading, as long as the tube; petals dentate or crenate. Gardens. *July.*

4. *D. Plumárius*.*Single Pink.*

Glaucous; leaves linear, scabrous on the margin; flowers 2–3, solitary, varying from purple to white; calyx-teeth obtuse; scales ovate, acute; petals many-cleft, hairy at the throat. *June–Aug.* Gardens.

5. *D. Caryophýllus*.*Carnation.*

Glaucous; leaves linear-subulate, channelled; flowers large, solitary, fragrant; scales very short, ovate; petals very broad, beardless, crenate. Stem 1–3 ft. high, branched. From this species, under the influence of cultivation, have been derived all the splendid varieties of Carnations, whose flowers are of all possible colors, and combinations of colors, except blue; but the most common is that shade of red known as *pink*.

5. *STELLARIA*.

Sepals 5, connected at the base. Petals 5, 2-cleft. Stamens 10, rarely fewer. Styles 3, sometimes 4. Capsule 1-celled, 3-valved, many-seeded.

1. *S. média*.*Chickweed.*

Stem procumbent, marked with alternate hairy lines; leaves ovate, smooth, with ciliate petioles; flowers small, white; petals oblong, deeply-cleft, a little shorter than the sepals; stamens varying from 3–10. A common weed in waste places, blooming from March to November. *An. or bien.*

2. *S. longifolia*.*Stitchweed.*

Stem weak, usually with rough angles, very slender and brittle; leaves linear, sessile, 1-nerved; flowers larger than in the last, white, in long, terminal, divaricate cymes, with lanceolate, scarious bracts; petals deeply-cleft, becoming longer than the acute 3-veined sepals. Grows 8'–20' high in meadows, supporting itself by other plants. *June–July. Per.*

6. *CERÁSTIUM*.

Sepals 5, somewhat united at base. Petals 5, bifid. Stamens 10, rarely fewer, alternate ones shorter. Styles 5. Capsule cylindrical, or roundish, 1-celled, 10-toothed. Seeds numerous.

1. *C. vulgátum*.*Mouse-ear.*

Hairy, pale-green, growing in tufts; stems assurgent, or spreading; leaves ovate or obovate, obtuse, attenuate at base; flowers white, in somewhat capitate clusters, when young longer than the pedicels; sepals green, a little shorter than the petals. Fields and waste places. Introduced. *April–Sept. Bien.*

2. *C. viscosum*.*Large Mouse-ear.*

Hairy, viscid, spreading; leaves lance-oblong, rather obtuse; flowers white, in loose cymes, when young, shorter than the peduncles; petals scarcely equaling the calyx. Plant of a deeper green than the last, with narrower leaves. Fields. *May–Sep. Per.*

7. *ARENÁRIA*.

Sepals 5. Petals 5, entire. Stamens 10, rarely fewer. Styles

3. Capsule 3-valved; valves usually 2-parted.

1. *A. serpyllifolia*.*Sandwort.*

Stem diffuse, dichotomous, pubescent, with reflexed hairs; leaves very small, ovate, sessile, acute, somewhat ciliate; flowers small, white, axillary and terminal, numerous; sepals lanceolate, acuminate, hairy, striate, twice as long as the oval petals; capsule ovate, 6-toothed, equalling the sepals. In cultivated grounds 3'–4' high. Introduced. *May–June. An.*

2. *A. lateriflora*.*Starwort.*

Slightly pubescent; stem erect, slender, nearly simple; leaves oblong or oval, obtuse; peduncles lateral and terminal, 2–3 flowered; flowers large, white; petals more than twice the length of the calyx. An elegant species, 4'–10' high in meadows and damp grounds. *June. Per.*

8. *HONCKÉNIA*.

Sepals 5, united at base. Petals 5, unguiculate, entire. Stamens 10, inserted with the petals into a glandular disk. Styles 3–5. Capsule 3–5-valved, 1-celled, 8–10 seeded. *An.*

1. *H. pelloides*.*Sea Sandwort.*

Very fleshy; stem creeping, sending up erect, mostly simple branches; leaves ovate, abruptly acute, veinless; flowers pedicellate, axillary, small, white; sepals ovate, obtuse; petals wedge-obovate. The upright branches are 8'–12' high. Atlantic coast. *July.*

9. *SAGINA*.

Sepals 4–5, united at base. Petals 4–5, entire, or none. Stamens 4–5. Capsules 4–5 valved, many-seeded. *An.*

1. *S. procumbens*.*Pearlwort.*

Glabrous; stem slender, procumbent; leaves linear, mucronate; flowers small, white or green, axillary, on long peduncles; petals half as long as the sepals, sometimes wanting; stamens sepals and petals 4–5. A little creeping plant, in wet springy grounds. *May–July.*

10. *ANYCHIA*.

Sepals 5, ovate-oblong, connivent, subsaccate at the apex. Petals none. Stamens 2–5, inserted on the base of the sepals. Utricle inclosed in the sepals. *An.*

1. *A. dichótoma*.*Forked Chickweed.*

Stem erect, smooth, or pubescent above, dichotomously branched, slender; leaves oval, or oblong, sessile; cauline ones opposite, those of the branches alternate, acute or obtuse, smooth; flowers minute, white, axillary, solitary, or in terminal clusters of 3. A delicate, very branching plant, on hill sides, 4'–8' high. *June–Aug.*

11. *SPÉRGULA*:

Sepals 5, nearly distinct. Petals 5, entire. Stamens 5–10. Styles 3–5. Capsules ovate, 3–5-valved, many-seeded.

1. *S. arvensis*.*Corn Spurrey.*

Stem erect, terete, branching, somewhat viscid; leaves linear-subulate, verticillate, 10–20 in a verticil, fasciculate also in the axils, dark green; stipules minute; peduncles reflexed in fruit; flowers in terminal, forked cymes; petals white, longer than the sepals; capsule twice as long; stamens 10; styles 5; seeds uniform. Introduced. About a foot high, in cultivated grounds. *May–Aug. An.*

2. *S. rubra*.*Red Corn Spurrey.*

Stem decumbent, much branched, smooth; leaves narrow-linear, somewhat fleshy, acute, or mucronate, with tufts of leaves or branchlets in the axils, opposite, sessile. Stipules ovate, cleft; flowers small, solitary, axillary, red, or rose-color, on hairy peduncles. A variable little plant, in dry soils and road sides, its delicate flowers furnishing a happy contrast to the barren sand which is its common habitat. A variety is common in salt marshes, which is more fleshy, with larger leaves and stems; often erect with paler flowers. *May–Nov. Per.*

12. *SCLERÁNTHUS*.

Sepals 5, united at base and inclosing the 1-seeded utricle. Petals none. Stamens 10 or 5, inserted at the throat of the calyx. Styles 2. *An.*

1. *S. annuus*.*Knawel*.

Slightly pubescent; stem procumbent, branching, tufted; leaves numerous, narrow-linear, acute, opposite, partially united at base; flowers small, greenish, nearly sessile, in leafy axillary clusters. A common little weed in dry soils. Stems 2'—4' long. *June—July*.

13. MOLLÛGO.

Sepals 5, united at base. Petals none. Stamens 5, sometimes 3—10. Styles 3. Capsule 3-valved, 3-celled, many-seeded. *An.*

1. *M. verticillata*.*Carpet-weed*.

Stem branched, depressed; leaves spatulate, entire, arranged in apparent verticils of 5 at each joint; flowers greenish-white, axillary, pedunculate; stamens mostly 3. A very common weed in cultivated grounds, spreading flat on the surface, making a sort of carpet. *July—Sep.*

ORDER XXI. Portulacacææ.—*Purslane-family*.

1. PORTULACA.

Sepals 2, united below; the upper portion deciduous. Petals 4—6, equal. Stamens 8—20. Styles 3—6 cleft at apex. Capsule a pyxis, sub-globose, dehiscing near the middle, many-seeded. *An.*

1. *P. oleracea*.*Purslane*.

Stem thick and fleshy, very branching, prostrate, spreading; leaves cuneiform, sessile; flowers pale yellow, sessile; petals 5, cohering at base; foliage of a reddish-green color. A very common and exceedingly troublesome weed in cultivated grounds and waste places. Introduced. *June—July*.

2. *P. pilosa*.*Scarlet Purslane*.

Stem exceedingly diffuse, purple; branches suberect, enlarged upwards; leaves linear, obtuse, with tufts of long hair in the axils; flowers large, terminal, sessile, solitary, or several together, surrounded by leaves, and dense tufts of hair; petals coherent at base, scarlet or purple. A brilliant species, native at the south-west, common in cultivation. *July—Aug.*

2. CLAYTONIA.

Sepals 2, persistent. Petals 5, hypogynous, emarginate or obtuse. Stamens 5, inserted on the claws of the petals. Stigma 3-cleft. Capsule 3-valved, 2—5-seeded. *Per.*

1. *C. Virginica*.*Spring Beauty*.

Stem simple, rather succulent, glabrous; leaves opposite, linear, tapering below with petioles; flowers white, veined with purple, in a terminal raceme, on slender nodding pedicels; sepals rather acute; petals mostly emarginate. A handsome little plant 4'—8' high, arising from a root buried deep in the ground. Stem with 2 opposite leaves. Low grounds. Rare in N. Eng. but common westward.

2. *C. Caroliniana*.*Spring Beauty*.

Smooth, somewhat succulent; leaves ovate-lanceolate, somewhat spatulate at base or abruptly decurrent into the petiole; radical ones few, spatulate; flowers smaller than in the last, rose-color, veined with purple, in a terminal raceme, with slender nodding pedicels; sepals and petals very obtuse; root tuberous, deep in the ground. A delicate species smaller than the last, common in certain districts. *Ap.—May*.

ORDER XXII. Mesembryanthemacææ.—*Ice-plant-family*.

1. MESEMBRYANTHEMUM.

Sepals 4—8, usually 5. Petals numerous, in many rows. Stamens numerous, attached to the calyx. Ovaries many-celled. Seeds numerous. *Per.*

1. *M. crystallinum*.*Ice-plant*.

Stem creeping; leaves ovate, acute, wavy, frosted, 3-veined beneath; flowers white, appearing through the summer. A biennial plant common in house cultivation. The stem and foliage are covered with warty foot-like protuberances.

2. *M. cordifolium*.

Stem procumbent, spreading; leaves cordate-ovate, opposite, petiolate, flowers pink; calyx thick, green. A succulent, fleshy plant, common in house cultivation.

ORDER XXIII. Malvaceæ.—*Mallow-tribe*.

SYNOPSIS OF THE GENERA.

* **Calyx with an involucrel at base.**

1. *MÁLVA*. Calyx with a 3-leaved involucrel. Carpels separating when ripe.
2. *ALTHEA*. Calyx with a 6—9-cleft involucrel. Carpels separating when ripe.
3. *HIBISCUS*. Calyx with a many-cleft involucrel. Carpels united into a 5-celled capsule.

** **Calyx without an involucrel.**

4. *ABUTILON*. Capsule of 5, or more, separate carpels.

1. *MÁLVA*.

Calyx 5-cleft, with an involucrel, mostly of 3 leaves. Carpels several, 1-celled, 1-seeded, dry, indehiscent, circularly arranged.

1. *M. rotundifolia*.*Low Mallow*.

Stems prostrate, branching; leaves on long, pubescent petioles, orbicular, cordate at base, obtusely 5-lobed, crenate, thin; flowers axillary, pedicellate, pale pink, or whitish; pedicels reflexed in fruit; petals twice as long as the acute segments of the calyx, deeply notched; involucre 3-leaved; fruit spherical, depressed in the centre, mucilaginous, and called "*cheeses*" by children on account of the shape. Introduced into cultivated grounds and waste places. *May—Sep. Per.*

2. *M. sylvestris*.*Garden Mallow*.

Stem erect; leaves 5—7-lobed; lobes acutish; peduncles and petioles hairy; flowers large, reddish-purple. A common garden plant, sometimes naturalized in the Middle States, growing 3 feet high. *June—Oct. Per.*

3. *M. crispa*.*High Mallow*.

—Stem erect, simple; leaves angularly lobed and toothed, frilled, smooth; flowers small, white, axillary, sessile. A tall plant, 5—6 feet high, of no beauty, in gardens, sometimes naturalized in waste places. *June—Aug. An.*

2. *ALTHEA*.

Calyx surrounded by a 6—9-cleft involucrel. Carpels numerous, indehiscent, arranged circularly around the axis, separating when ripe.

1. *A. officinalis*.*Marsh Mallow*.

Stem erect, downy; leaves alternate, softly tomentose on both sides, cordate or ovate, 3-lobed, or sometimes entire; peduncles much shorter than the leaves, many flowered; flowers large pale purple, axillary and terminal; root as well as the rest of the plant, mucilaginous; stem about 2 feet high. Borders of salt marshes. Introduced. *Aug.—Sep. Per.*

2. *A. rosea*.*Hollyhock*.

Stem erect, hairy; leaves rough, cordate, 5—7-angled; flowers large, axillary, sessile. A common garden biennial, 6—8 feet high. Flowers red, purple white, or yellow, and all intermediate tints, often double.

3. *HIBISCUS*.

Calyx 5-cleft, surrounded by a many-leaved involucrel. Stigmas 5. Carpels 5, united into a 5-celled capsule. Cells several seeded.

1. *H. Moscheutos*.*Marsh Hibiscus*.

Stem simple, erect, terete, downy; leaves ovate, acuminate, serrate, often 3-lobed, hoary-tomentose beneath, somewhat rough and pubescent above; peduncles long, axillary, or united to the petioles; flowers very large, 3' in diameter, rose-color, crimson in the centre, solitary; petals obovate, retuse; style much longer than the stamens. A splendid plant 3—6 feet high, growing on the borders of marshes, especially near the sea. *Aug.—Sep. Per.*

2. *H. Syriacus*.*Althæa*.

Leaves cuneiform, 3-lobed, toothed; flowers delicate, large, purple, axillary on peduncles scarcely longer than the petiole, solitary; varieties have white, red, and variegated flowers. A fine shrub, 5—10 feet high, hardy when it has attained its full size, but rather tender when young. *July—Sep.*

3. *H. triënum*. *Flower of an hour.*

Leaves dentate, lower entire, upper 3-lobed; lobes lanceolate, middle one very long; flowers large, numerous, soon withering, of a peculiarly rich yellow, with a deep brown circle in the centre: calyx inflated, membranous, veined. A very beautiful species, 1–2 feet high, common in gardens. *July–Aug. An.*

4. *ABUTILON*.

Calyx 5-cleft, without an involucre. Ovary 5-celled, several-seeded. Capsule of 5 or more carpels, which are 2-valved, 1–3-seeded. *An.*

1. *A. Avicënnæ*. *Indian Mallow.*

Stem erect, with spreading branches; leaves orbicular, cordate, acuminate, somewhat dentate, velvety-tomentose; flowers rather large, orange yellow, on axillary peduncles, which are solitary, and shorter than the petiole; carpels about 15, 8-seeded, inflated, truncate, 2-beaked, hairy. A tall plant, 2–5 feet high. Introduced and naturalized in waste places and road-sides. *July–Sep.*

ORDER XXIV. *Tiliacææ.—Linden-family.*1. *TILIA*.

Sepals 5, united, colored. Petals 5. Stamens numerous, arranged in several parcels, mostly 5 in each set (in the N. American species), together with a petaloid scale. Ovary globose, 5-celled. Cells with 2 ovules, 1–2-seeded.

1 *T. Americæna*. *Bass-wood.*

Leaves alternate, obliquely cordate, or truncate at base, sharply serrate, abruptly acuminate, glabrous, coriaceous; flowers dull white, with a heavy, rather fragrant odor, in dense, pendent cymes of curious structure. The peduncle is united to the mid-vein of a large leaf-like oblong bract, of a yellowish green color; petals truncate, or obtuse, crenate at apex, longer than the scales at base; fruit mostly greenish, as large as peas. The inner bark is very mucilaginous, and its fibre is extremely strong. A tall, elegant tree of regular growth, in woods and low grounds. *June.*

2. *T. microphylla*. *Linden.*

Leaves cordate, scarcely oblique, acuminate, smooth on both sides, twice as long as the petioles; axils of the veins bearded beneath; flowers closely resembling those of the last; staminate scale none; fruit oblong, unequal, 2-seeded, membranaceous. A tall tree, becoming common in cultivation, especially used for shading streets. *June–July.*

ORDER XXV. *Ternstroëmiacææ.—Tea-family.*1. *CAMELLIA*.

Sepals imbricated; inner ones larger. Petals sometimes united at base. Styles united. Stigmas 3–5, acute.

1. *C. Japonica*. *Japan Rose.*

Leaves ovate, acuminate, sharply serrate, smooth and shining on both sides, coriaceous, on short petioles; flowers large, mostly double in cultivation, varying from white to red, terminal, and mostly solitary; petals obovate; stamens in single flowers, about 50; stigma unequally 5-cleft. A splendid green-house shrub, quite common in cultivation, and sporting into numerous varieties.

ORDER XXVI. *Aurantiacææ.—Orange-family.*1. *CITRUS*.

Sepals 5, united. Petals 5. Stamens arranged in 4 or more clusters of 5 each. Filaments dilated at base. Fruit a berry, 9–18-celled.

1. *C. limönum*. *Lemon Tree.*

Leaves, or rather leaflets, oval, acute, toothed; petioles somewhat winged, articulated with the lamina, showing the leaf to be in reality the terminal leaf-

let of a reduced compound leaf; flowers white, fragrant; stamens 35; fruit pale yellow, oblong-spheroidal, rind thin, pulp very acid. A low tree, or large shrub, common in green houses.

2. *C. Aurantium*. *Orange.*

Leaf, or leaflet, oval, acute, crenulate; petioles winged; stamens 20; berry globose, with a thin rind, and sweet pulp; flowers white, very fragrant. A middle-sized tree in the tropics, a shrub in green-houses and house-cultivation.

ORDER XXVII. *Linacææ.—Linen family.*1. *LINUM*.

Sepals entire, 5. Petals 5. Styles 5, rarely 3. Capsule 5-celled, globose.

1. *L. Virginianum*. *Wild Flax.*

Glabrous; stem erect, slender, branching; leaves alternate; lower ones sometimes opposite, oblong-lanceolate, or oblong; upper ones linear; flowers yellow, in corymbose, terminal panicles, with racemose branches; sepals ovate, mucronate, 1-nerved, a little shorter than the spherical capsule; petals obovate. A slender delicate plant on dry hills, about 1 ft. high. *An.*

2. *L. usitatissimum*. *Flax.*

Glabrous; stem branching above; leaves alternate, linear-lanceolate, very acute; flowers large, blue, in a corymbose panicle; sepals ovate, 8-nerved at base, with membranaceous margins; petals subcrenate. Sometimes cultivated in this country for the seed, which yields linseed oil, rarely for the fibre, which is the basis of the linen fabric. Sometimes found in fields where it has strayed. *June–July. An.*

ORDER XXVIII. *Geraniacææ.—Geranium family.*1. *GERANIUM*.

Sepals 5, equal. Petals 5, equal. Stamens 10, all fertile; alternate ones larger, with a nectariferous gland at base. Styles persistent, smooth inside, at length circinate-revolute. Fruit beaked, separating at length into 5-carpels, tipped with long styles.

1. *G. maculatum*. *Cranesbill.*

Stem erect, dichotomous, angular, pubescent with reflexed hairs; leaves palmately 5–7-parted, lobes cuneiform, entire below, incisely serrulate above; peduncles dichotomous, 1–8-flowered; pedicels unequal, pubescent; flowers large, light purple; sepals awned; petals entire. A beautiful species, finer than many that are cultivated, but soon fading. It is easily distinguished by the spots about the sinuses of the leaves, which usually appear as the plant advances in age. Borders of woods, fields, and thickets. Stem 1–2 ft. high. *May–June. Per.*

2. *PELARGONIUM*.

Sepals 5; upper one terminating in a nectariferous tube, extending down the peduncle. Petals 5, irregular, larger than the sepals. Filaments 10; 3 of them sterile. *Lower leaves in plants raised from the seed opposite; upper ones alternate. Per.*

1. *P. odoratissima*. *Sweet-scented Geranium.*

Stem short, succulent; branches herbaceous, long, spreading; leaves roundish, cordate, very soft; flowers small, whitish, in umbels, which are about 5-flowered. Chiefly cultivated for the pleasant odor of the leaves.

2. *P. zonale*. *Horse-shoe Geranium.*

Stem thick, shrubby; leaves orbicular, cordate at base, with shallow lobes, dentate, marked with a colored zone near the margin; flowers bright scarlet, in umbels with long peduncles. One of the most common species in cultivation.

3. *P. inquinans*. *Scarlet Geranium.*

Stem erect, with downy branches, covered with a reddish, viscid moisture staining the fingers; leaves round-reniform, scarcely lobed, crenate, viscid; flowers bright scarlet, in many-flowered umbels. Very popular in cultivation.

4. *P. peltatum*. *Ivy-leaved Geranium*.

Stem long, climbing; leaves 5-lobed, with the lobes entire, fleshy, smooth, nearly or quite peltate; flowers handsome, of a purplish tinge, in few-flowered umbels.

5. *P. grandiflorum*. *Large-flowered Geranium*.

Smooth, glaucous; leaves 5-lobed, palmate, coriolate at base, the lobes toothed toward the summit; flowers large, white; petals 3 times as long as the calyx. A beautiful species.

6. *P. graveolens*. *Rose Geranium*.

Leaves palmate, 7-lobed, the lobes oblong, bluntly toothed, with scabrous and serrulate margins; flowers purple, in many-flowered and capitate umbels. Valued especially on account of the fine fragrance of its leaves.

7. *P. quercifolium*. *Oak-leaf Geranium*.

Leaves cordate, pinnatifid, with rounded sinuses; the rough, often spotted lobes obtusely crenate; branches and petioles hispid; flowers purple.

ORDER XXIX. Oxalidaceæ.—*Wood-sorrel family*.

1. OXALIS.

Sepals 5, distinct or united at base. Petals 5, much longer than the calyx. Capsule oblong, or subglobose. Carpels 5, with 1-several seeds. *Per*.

1. *O. stricta*. *Wood-sorrel*.

Stem erect, branching or simple, smooth, leafy; leaves trifoliate, on long petioles; leaflets obcordate, smooth; flowers yellow; peduncles bearing umbels of 2-6 flowers, longer than the petioles, axillary; capsules somewhat hirsute, leaves acid to the taste. Varies in height from 3'-6'. Fields; common; flowering all summer.

ORDER XXX. Balsaminaceæ.—*Balsamine family*.

1. IMPATIENS.

Sepals 5, colored, apparently 4, from the union of the 2 upper ones; lowest gibbous and spurred. Petals 4, apparently 2, from the fact of the lower ones being united to each of the lateral ones. Stamens with anthers cohering at the apex. Capsule often 1-celled, from the disappearance of the dissepiments, 5-valved, bursting elastically. *An*.

1. *I. fulva*. *Jewel-weed*.

Stem smooth, branching, succulent; leaves rhombic-ovate, rather obtuse, coarsely and obtusely serrate, with mucronate teeth, petiolate; flowers large, deep orange, spotted with brown dots, very irregular in form; peduncles 2-4 flowered; lower sepal acutely conical; spur longer than the petals, recurved. A very succulent and somewhat glaucous plant, 1-3 feet high, with handsome flowers, in wet grounds. Capsule bursting elastically, and scattering the seeds. *June-Sep*.

2. *I. balsamina*. *Balsamine. Touch-me-not*.

Stem erect, succulent, branching; leaves lanceolate, serrate, lower ones opposite, upper alternate; pedicels clustered; flowers large, in axillary clusters, shorter than the leaves; spur shorter than the flower. A very common and exceedingly beautiful annual.

ORDER XXXII. Tropæolaceæ.—*Nasturtium family*.

1. TROPÆOLUM.

1. *T. majus*. *Nasturtium*.

Leaves peltate, orbicular, repand on the margin; petioles long, inserted a little out of the centre of the leaf; flowers large, brilliant orange-colored, with darker spots; petals obtuse; the 2 upper distant from the 3 lower, which are fimbriate at base with long, narrow claws. A long trailing plant, climbing by its petioles. *June-Nov. An*.

ORDER XXXIII. Rutaceæ. *Rue-family*.

1. RUTA.

Sepals 4-5, united at base. Petals 4-5, concave, obovate, distinct. Torus surrounded by 10 nectariferous pores. Stamens 10. Capsule lobed. *Per*.

1. *R. graveolens*. *Rue*.

Nearly smooth, suffrutescent; leaves bi- and tripinnately divided; segments oblong, obtuse, terminal ones wedge-obovate; all entire, or incised, punctate with conspicuous dots; flowers yellow, terminal, corymbose; petals entire. A garden plant growing 3-4 ft. high.

ORDER XXXIV. Zanthoxylaceæ.—*Prickly Ash-tribe*.

1. ZANTHOXYLUM.

Polygamous. Perfect flowers—Sepals 5. Petals none. Stamens 3-6. Pistils 3-5. Carpels 3-5, 1-seeded. Fertile flowers same as the perfect, only wanting the stamens, and the barren, also, are the same, wanting only the pistils.

1. *Z. Americanum*. *Prickly Ash*.

Branches and petioles armed with stout, hooked prickles; leaves pinnate; leaflets 5-7, ovate, mostly entire, sessile, more or less pubescent, especially beneath; flowers small, greenish, in axillary umbels, appearing just before the leaves; perfect and staminate flowers growing on the same tree; pistillate on a different one. Bark bitter, aromatic, used in medicine for toothache and rheumatism. Woods; not very common; sometimes cultivated. *An*.

2. AILANTHUS.

Polygamous. Sepals 5, more or less united at base. Petals 5. Stamens of the perfect flowers 2-3. Ovaries 3-5. Fruit a 1-celled, 1-seeded samara, with an oblong border. Stamens of the barren flowers 10. Fertile flowers same as the barren, except the stamens.

1. *A. glandulosa*. *Ailanthus-tree*.

Leaves smooth, unequally pinnate; leaflets ovate or oblong-lanceolate, acuminate, very shortly petiolate, with 1 or 2 obtuse, glandular teeth each side at base, terminal one with a long petiole; flowers greenish, in terminal panicles, of an intolerably offensive odor. A large, rapid-growing tree, with luxuriant foliage. The leaves are often from 2-9 feet long, with 10-20 pairs of leaflets of an offensive, sickening odor. Young branches light brown, smooth. Common in cultivation. *June*.

ORDER XXXV. Anacardiaceæ.—*Sumach-family*.

1. RHUS.

Sepals 5, united at base. Petals 5. Stamens 5. Styles 3. Stigmas capitate. Fruit a dry drupe, containing a single, bony, 1-celled nut. Flowers by abortion often dioecious.

1. *R. glabra*. *Sumach*.

Young branches smooth; leaves pinnate, 6-15-foliate; leaflets lance-oblong, acuminate, smooth, paler beneath, sessile, sharply serrate; flowers small, greenish, in dense, terminal, thyrsoid panicles, followed by small drupes covered with crimson hairs, of a sour taste. A shrub 6-10 feet high, in pastures and thickets, of an irregular straggling growth, and very pithy, brittle stems. *June-July*.

2. *R. typhina*. *Stag-horn Sumach*.

Young branches and petioles densely villous; leaflets 13-31 oblong-lanceolate, obtuse at base, acuminate, sharply serrate, pubescent beneath, especially the mid-vein; flowers yellowish green, in dense thyrsoid, terminal panicles; drupes compressed, densely covered with acid, crimson hairs. A shrub resembling the last in its mode of growth, but larger, 10-20 feet high, distinguished by its exceedingly villous branchlets. Wood sulphur-yellow, of an aromatic odor. Rocky, barren fields. *June*.

3. *R. copallina*. *Mountain Sumach*.

Branches and petioles pubescent; leaflets 9-21, oval-lanceolate, acute, or acuminate, nearly entire, shining above, pubescent beneath, oblique at base;

common petiole winged; flowers greenish, in thyrsoid, sessile, terminal panicles; drupes red, hairy, acid. A smaller shrub than the last, in rocky, barren grounds. *July*.

4. *R. venenata*. *Dogwood, Poison Sumach*.

Very glabrous; leaflets 7—13, mostly oval, entire, abruptly acuminate; common petiole not winged, red; flowers very small, green, mostly dioecious, in loose, axillary, pedunculate panicles; drupes subglobose, smooth, greenish, as large as peas. A very elegant shrub, in swamps, with leaves of a shining green, 10—15 feet high, and exceedingly poisonous to most persons, producing eruptions on the skin, when touched, and in some cases even when approached very nearly. *June*.

5. *R. toxicodendron*. *Poison-Oak, Poison-Ivy*.

Stem erect, or decumbent; leaves pubescent, ternate; leaflets broad-oval, or rhomboid, acuminate, entire, or pinnately-toothed; flowers green, in racemose, axillary, subsessile panicles; drupes subglobose, smooth, pale brown. A low shrub 1—3 feet high, poisonous, but less so than the last.

Var. *Radicans*. Leaflets entire, mostly smooth; stem long, climbing by radicles, often 20—30 feet, or more. This variety, by some authors considered a species, is very distinct in habit, and in N. Eng. is by far the most common form, if indeed the other be found there at all. *June*.

6. *R. Cotinus*. *Smoke-tree*.

Leaves obovate, entire; flowers mostly abortive, minute, in terminal compound panicles; pedicels finally elongated, and clothed with long hairs. A shrub 6 feet high, not uncommon in cultivation, chiefly remarkable for the peculiar appearance of its panicles, which cause the plant to look, at a distance, as if enveloped in a cloud of smoke.

ORDER XXXVI. Aceraceæ.—Maple-tribe.

1. ACER.

Flowers mostly polygamous. Calyx 5-cleft. Petals 5, or none. Stamens 7—10, rarely 6. Styles 2. Samaras 2, winged, united at base, by abortion 1-seeded.

1. *A. rubrum*. *Red Maple*.

Leaves palmate, 3—5-lobed, mostly cordate at base, unequally or incisely-toothed, whitish, and nearly or quite smooth beneath; lobes acute or acuminate; sinuses acute; flowers crimson, rarely yellowish, on short pedicels, aggregate, about 5 together; pedicels in fruit elongated and pendulous; fruit red, with wings about 1' long. A tall, handsome tree, common in low grounds and swamps. It makes a splendid appearance in April, before the leaves come out, when covered with its numerous crimson flowers.

2. *A. dasycarpum*. *White Maple*.

Leaves deeply 5-lobed, mostly truncate at base, sometimes cordate, white, and smooth beneath; sinuses obtuse; lobes acute, or acuminate, unequally or incisely-toothed, entire toward the base; flowers small, yellowish-green, in crowded, simple umbels; pedicels short and thick; petals none; fruit tomentose when young, nearly smooth when old, with very large upwardly dilated diverging wings; pedicels elongated in fruit. Distinguished from the last, which it much resembles, by its larger leaves and fruit, and yellowish short-pedicelled flowers. Wood white, soft. Sap less sweet than that of the Sugar Maple. *April*.

3. *A. saccharinum*. *Sugar Maple*.

Leaves palmately-lobed, cordate at base, or truncate, glaucous, pubescent or smooth beneath; sinuses obtuse and shallow; lobes acuminate, with a few coarse, repand teeth; flowers pale yellow, on long, pendulous, filiform, villous pedicels; sepals bearded inside; petals none; fruit yellowish, with wings 1' long. A noble tree of the most elegant foliage and growth, very often cultivated as a shade tree. Its sap yields that universal favorite, Maple Sugar. Rocky woods. *May*.

4. *A. Pennsylvanicum*. *Moose-wood*.

Leaves subcordate at base, 3-lobed at summit, sharply and doubly serrate, smooth; lobes acuminate; flowers large, yellowish-green, in simple, nodding racemes; petals obovate; fruit in long clusters, glabrous, with pale green, diverging wings. A small tree, 10—15 feet high, the bark striped with green and black. Common in Northern N. Eng. and N. York, rare further South. *May*.

5. *A. spicatum*.

Mountain Maple.

Leaves pubescent beneath, somewhat cordate at base, 3—5-lobed, dentate small, rough; lobes acuminate; flowers very numerous, minute, greenish, in erect, compound racemes; petals linear-spatulate; fruit almost smooth, with wings slightly diverging, in pendulous racemes. A shrub, 6—10 feet high, found in about the same localities as the last. *June*.

ORDER XXXVII. Hippocastanaceæ.—Horse-Chestnut-family.

1. ÆSCULUS.

Calyx campanulate, tubular, 5-toothed. Petals 4—5, more or less unequal. Otherwise as in the character of the order.

1. *Æ. Hippocastanum*. *Horse-Chestnut*.

Leaves digitate; leaflets 7, obovate, abruptly acute, serrate; flowers large, in pyramidal thyrses or racemes, pink and white; stamens and styles longer than the petals; fruit large, dark chestnut colored, not eatable. A noble tree, 40—50 feet high, admired for its elegant growth and foliage, as well as for its showy flowers. *June*.

ORDER XXXVIII. Celastraceæ.—Staff-tree-family.

1. CELÁSTRUS.

Flowers sometimes dioecious or polygamous. Sepals 5, united below into a very short tube. Petals 5, sessile. Capsule subglobose, 2—3-celled. Seeds ariled, 1—2 in each cell.

1. *C. scandens*. *Shrubby Bittersweet*.

Stem woody, twining; leaves oval, or somewhat obovate, acuminate, serrate, alternate, stipulate, smooth; flowers small, greenish-white, in nearly simple racemes; seeds reddish-brown, covered with an aril, which at first is orange, but afterwards becomes scarlet. A climbing, woody plant, in woods, thickets, and along stone walls. *June*.

ORDER XXXIX. Rhamnaceæ.—Buckthorn-tribe.

1. RHÁMNUS.

Calyx urceolate, 4—5-cleft. Petals 4—5, emarginate, perigynous. Ovary free from the calyx, 2—4-celled. Styles 2—4, more or less united. Fruit drupaceous, containing 2—4 nuts.

1. *R. catharticus*. *Buckthorn*.

Leaves ovate, doubly serrate, acute, strongly veined, nearly smooth, alternate, in fascicles at the ends of the branches, in young, rapidly-growing shoots, often somewhat opposite; flowers polygamous, in axillary fascicles, mostly tetrandrous; sepals at length reflexed; petals entire; fruit black, globose, nauseous, and cathartic. A shrub, 10—15 feet high, with opposite branches, spinose at summit. Not uncommon in Eastern N. Eng. Road-sides. *June*.

2. *R. alnifolius*. *Alder-leaved Buckthorn*.

Erect, unarmed; leaves oval, acuminate, serrate, pubescent on the veins beneath; peduncles 1-flowered, solitary or aggregate, arising from the upper part of the young shoots; flowers yellowish-green, mostly pentandrous and apetalous; sepals acute, spreading; styles 3, united, very short; fruit turbinate, black, as large as a currant, 5-seeded. A low shrub, 8 feet high, in dense swamps, not uncommon in the northern parts of N. Eng. and N. York. *May—June*.

2. CEANÓTHUS.

Calyx campanulate, 5-cleft; the upper portion at length separating in a transverse line. Petals 5, longer than the calyx, saccate and arched, with long claws. Stamens exsert. Styles mostly 3, united as far as the middle, separate above. Fruit a dry, coriaceous capsule, obtusely triangular, 3-celled, 3-seeded, surrounded at base by the persistent calyx-tube.

I. C. Americānus.

Jersey Tea.

Young branches pubescent; leaves ovate, or oblong-ovate, serrate, nearly smooth above, white-downy beneath, as likewise the petioles and veins; flowers small, white, numerous, in dense, axillary, pedunculate, naked, thyrsoid panicles. A small shrub, with a profusion of white flowers, growing in woods and copses, preferring a rather dry soil. Stem 2—3 feet high, with reddish, slender branches. *June*.

ORDER XL. Staphyleaceæ.—Bladdernut-family.

1. STAPHYLĒA.

Flowers perfect. Sepals 5, colored, persistent, erect. Petals 5. Stamens 5. Styles 3. Capsules membranaceous, 3-celled, 3-lobed.

1. S. trifolia.

Bladdernut.

Leaves ternate, opposite; leaflets ovate, acuminate, finely serrate, pubescent when young, at length smooth; stipules caducous; flowers white, in nodding, axillary racemes; petals narrow-obovate, ciliate at base; stamens somewhat exserted; fruit composed of 3, inflated, united, 1-several-seeded carpels, distinct at apex; seeds smooth and polished. An elegant shrub, 6—12 feet high, in low grounds and thickets. *May*.

ORDER XLI. Vitaceæ.—Grape-family.

1. VITIS.

Calyx nearly entire. Petals 4—5, united at top, or distinct and spreading, deciduous. Ovary surrounded and partly inclosed in the elevated torus, 2-celled; cells 2-ovuled. Berry 1-celled, 1—4-seeded. *Peduncles changing to tendrils.*

1. V. Labrusca.

Wild Grape.

Leaves broadly cordate, often 3-lobed, repand-toothed, tomentose beneath, veins covered with ferruginous pubescence; flowers diœcious, small, green, in compact, oblong panicles, opposite the leaves; fruit large, globose, black, sometimes greenish or reddish-purple, pleasant and eatable when fully ripe, with a tough pulp. A common species in low grounds, with very long stems, which often reach the tops of the highest trees, climbing by means of its tendrils. *June*.

2. V. cordifolia.

Frost Grape.

Young branches mostly smooth; leaves cordate, acuminate, somewhat equally-toothed, often 3-lobed when young, pubescent on the veins beneath, glabrous on both sides when old; racemes loose, many-flowered; berries small, black, late, very acid, till moderated by the frosts of November. A smooth species, not uncommon in low grounds and woods, but by no means so frequent as the last.

3. V. vinifera.

Wine Grape.

Leaves cordate, sinuately 5-lobed, smooth or tomentose; flowers all perfect. The size and color of the fruit are exceedingly varied. This is the Wine Grape of Europe, but is cultivated in this country under glass, or in the case of some hardy varieties, in the open grounds, for table use. The Wine Grapes of this country are varieties of V. Labrusca. *June*.

2. AMPELOPSIS.

Calyx entire. Petals 5, distinct, spreading. Torus without a ring. Ovary 2-celled; cells 2-ovuled. Style very short, conical. Berry 2-celled; cells 1—2-seeded.

1. A. quinquefolia.

Woodbine.

Stem climbing, smooth; leaves digitate-quinate; leaflets oblong, serrate, acuminate, petiolate, smooth; flowers greenish, in dichotomous, many-flowered panicles; berries dark blue, as large as a small pea, with crimson peduncles and pedicels. A rapidly growing and spreading vine, climbing to a great height over trees and the walls of buildings, covering them with its dense foliage, for which purpose it is often cultivated. Along fences and borders of woods. Common. The foliage turns crimson in autumn. *July*.

ORDER XLII. Polygalaceæ.—Polygala-family.

1. POLYGALA.

Sepals 5, persistent, with large petaloid wings. Petals 3, their claws adhering to the tube of filaments; lower one carinate. Capsule obcordate, 2-celled, 2-valved, 2-seeded. Seeds carunculate.

1. P. sanguinea.

Purple Polygala.

Stem angular, branching above, or simple; leaves narrow-linear, sessile; flowers rose-color, beardless, in dense, short spikes, resembling heads. As the flowers wither, they drop off, leaving the naked flexuous rachis. Wings of the calyx obovate. A pretty little plant, of meadows and wet grounds, with fastigiate branches, growing 6'—8' high. *July—Oct. An.*

2. P. verticillata. Green-flowered Polygala.

Stem erect, branched; leaves linear, in whorls of 5—6; spikes linear, slender, pedunculate; flowers very small, crested, greenish-white; bracts very deciduous; wings of the calyx roundish. A slender plant, with inconspicuous flowers, growing 3'—4' high on dry hills. *July—Oct. An.*

3. P. polygama.

Red Centaury.

Stems erect, smooth, simple, several from the same root; leaves alternate, entire, narrow-oblong; flowers deep rose-color, or purplish, in loose terminal racemes, at length pendulous; wings broad-obovate, spreading, longer than the corolla; capsule oblong, emarginate. Fields and hill-sides, growing 6'—8' high. Stem with radical racemes, either prostrate, or beneath the surface, with wingless and nearly apetalous flowers. Plant very bitter. *June—July. Per.*

4. P. paucifolia.

Fringed Polygala.

Stem erect, simple, leafy at summit; leaves ovate, entire, petiolate, terminal; flowers 2—3, large and handsome $\frac{1}{2}$ ' long, deep rose-color, on pedicels nearly $\frac{1}{2}$ ' long, crested; radical flowers wingless; lateral sepals oblong, concave; crest inconspicuous, purple; rhizoma creeping and branching, throwing up simple branches. A handsome plant, in low woods and swamps. The radical flowers are much smaller, of a greenish hue, and either prostrate or subterranean. *May. Per.*

ORDER XLIII. Leguminosæ.—Pea-family.

SYNOPSIS OF THE GENERA.

A. Corolla properly papilionaceæ.

* Leaves abruptly pinnate, tendriled.

1. LATHYRUS. Style filiform, bearded on the inner side next the free stamen
2. VICIA. Style, filiform, bearded on the outside. Legume oblong, not tumid. Seeds oval.
3. PISUM. Style bearded on the outside. Legume tumid. Seeds globose.

** Leaves unequally pinnate.

5. APOC. Calyx obscurely bilabiate; upper lip with 2 very short, rounded teeth; 2 lateral teeth nearly obsolete. Vexillum broad, with a longitudinal fold in the centre. Stem twining.

6. WISTARIA. Calyx abruptly bilabiate; upper lip with 2 short teeth; lower one of 3 nearly equal teeth. Vexillum with 2 callous processes, descending the claws. Stems twining.

8. ROBINIA. Calyx 6-toothed; 2 upper teeth more or less coherent, shorter than the others. Stamens diadelphous. Trees and shrubs with stipulate spines.

9. TEPHROSIA. Calyx with 5 nearly equal teeth. Stamens mostly monadelphous. Herbs.

*** Leaves pinnately 3-foliolate.

4. PHASEOLUS. Calyx campanulate, 5-toothed, 2 upper teeth more or less united. Legume usually somewhat linear, or compressed, many-seeded.

7. AMPHICARPEA. Calyx campanulate, mostly 4-toothed. Flowers of 2 kinds. Upper flowers complete, usually unproductive; those near the base apetalous, productive. Legumes flat, 1—4 seeded. Stems twining.

11. MELILLOTUS. Calyx tubular. Legume short, 1—4 seeded. Sweet-scented plants.

13. DESMODIUM. Legume compressed, composed of several separate, strongly hispid joints.

**** Leaves palmately 3-foliolate.

10. TRIFOLIUM. Flowers in heads. Calyx tubular, 5-cleft. Legume small, indehiscent, 2—4 seeded, included in the calyx.

12. MEDICAGO. Flowers in axillary, pedunculate spikes. Calyx cylindrical. Legume falcate, or spirally coiled.

14. LESPEDEZA. Flowers in dense, axillary, almost capitate spikes. Legume small, lenticular, reticulated, indehiscent, 1-seeded, usually flat.

17. BAPTISIA. Flowers in racemes at the ends of the branches. Legume much inflated, mostly 2-seeded.

***** **Leaves neither pinnate nor ternate.**

15. *CROTALARIA*. Legume much inflated. Leaves simple.

16. *LUPINUS*. Legume coriaceous, oblong, compressed. Leaves digitate.

B. Flowers not properly papilionaceous.

18. *CASSIA*. Flowers perfect. Petals 5, slightly unequal. Stamens 10. Leaves abruptly pinnate. Herbs.

19. *GLEDITSCHIA*. Flowers polygamous. Stamens 3—5. Leaves abruptly pinnate, or bipinnate. Thorny trees.

1. *LATHYRUS*.

Calyx campanulate, 5-cleft; 2 upper segments somewhat shorter. Style flat, dilated above, ascending, bent nearly at right angles with the ovary, pubescent, or villous on the inside next the stamen. *Per*.

1. *L. maritimus*.

Marsh Pea.

Glabrous, stem branching, stout, angled, at length decumbent; leaves abruptly pinnate, cirrhose; leaflets 8—12, oval or somewhat obovate, mucronate; common petiole large and fleshy, somewhat glaucous; stipules sagittate; flowers large, blue, or purple, on long, fleshy, axillary peduncles, in drooping racemes; legumes oblong, slightly falcate. A pale-green plant with handsome flowers, growing in beds on the shores of the sea, and the great lakes. *May—July*.

2. *L. palustris*.

Marsh Vetch.

Glabrous; stem ascending, winged; leaves 4—6 foliate, cirrhose; leaflets narrow-oblong, rather obtuse, mucronate, sessile; stipules minute, lanceolate, semi-sagittate; peduncles axillary, 3—5 flowered; flowers medium size, light purple, turning pale when old; legumes broad-linear, compressed, acuminate, pubescent. A slender and delicate but variable species. Found in meadows, supporting itself by its tendrils among the grass and other plants. Stem 1—2 ft. high. *June*.

2. *VICIA*.

Calyx tubular, 5-cleft, 2 upper teeth shortest. Banner emarginate. Style filiform, bent at a right angle to the ovary, villous at apex, particularly on the outside next the keel. Legume oblong, several-seeded.

1. *V. cracca*.

Tufted Vetch.

Stem branching, square, downy, very slender; leaves 18—20 foliate, cirrhose; leaflets narrow-oblong, mucronate, slightly pubescent; stipules lance-linear; peduncles as long as the leaves; flowers 20—30 imbricated, in dense, 1-sided, axillary racemes, almost sessile, bright blue, sometimes pale; legumes oblong, coriaceous, smooth. A slender plant, growing along fences and borders of woods. *June. Per*.

2. *V. tetrasperma*.

Smooth Vetch.

Stem somewhat tufted, glabrous, very slender; leaves 4—6 foliate, cirrhose; leaflets linear or oblong-linear; stipules lanceolate, semi-sagittate; peduncles usually 2-flowered; flowers very small, white, often tinged with blue, on filiform peduncles; legume oblong, glabrous, usually 4-seeded. A very slender, delicate plant, growing along rivers and streams. *July. An*.

3. *V. sativa*.

Vetch or Tare.

Stem simple, decumbent or climbing; leaves 10—12 foliate, cirrhose; leaflets oblong-obovate, sometimes linear, retuse, mucronate; stipules semi-sagittate, subdentate; flowers axillary, solitary, or in pairs, nearly sessile, pale purple, 1" long; legumes compressed, somewhat erect, reticulated, 1"—2" long. A slender plant, common in fields and cultivated grounds. Introduced. *June. July. An*.

3. *PISUM*.

Calyx-segments leafy; 2 upper shortest. Banner reflexed. Stamens 10, in 2 sets, 9 and 1. Style compressed, carinate, villous on the upper side. Legume oblong, tumid, many-seeded. Seeds globose. *An*.

1. *P. sativum*.

Pea.

Glaucous, smooth; stem nearly simple, climbing; leaves 4—6 foliate, cirrhose; leaflets ovate, entire; stipules ovate, semi-cordate at base, crenate; flowers large, white, 2—5 on axillary peduncles. A universally cultivated plant, and everywhere a favorite, as an esculent. It grows 2—5 feet high, climbing by its tendrils. *May—June*.

4. *PHASEOLUS*.

Calyx campanulate, 5-toothed, 2 upper teeth more or less united. Keel, together with the stamens and style spirally

twisted. Legume linear, or falcate, more or less compressed. *Herbaceous. Leaves pinnately trifoliate. Leaflets stipellate.*

1. *P. diversifolius*.

Lobe-leaved Bean.

Stem prostrate, trailing, sometimes climbing, rough-pubescent; leaflets ovate, angular, 2—3-lobed, or entire, as long as the petioles; stipules lanceolate; peduncles stout, longer than the leaves; flowers pale purple, 2—6 together, capitate, generally 2 open at once; lower tooth of the calyx longer than the tube; legume pubescent, broad-linear, cylindric, 5—7-seeded, black when ripe. A trailing plant, with a stem 3—4 feet long, in sandy fields, or along sandy shores. *Aug.—Oct. An*.

2. *P. perennis*.

Wild Bean.

Stem twining, pubescent; leaflets ovate, acuminate; racemes axillary, solitary, or several together, simple or slightly branched, longer than the leaves; flowers purple; legume pendulous, falcate, mucronate. A slender vine, 4—7 feet long in dry woods. *July—Aug. Per*.

3. *P. vulgaris*.

Bean.

Stem twining; leaflets ovate, acuminate; racemes solitary, shorter than the leaves; pedicels in pairs; calyx as short as its 2 bracts at base; legume pendulous; flowers white, sometimes pale purple. Cultivated every where in gardens, both for its young pods and ripe seeds.

4. *P. multiflorus*.

Scarlet Pole Bean.

Stem twining against the sun; leaflets ovate, acute; flowers large, scarlet, very ornamental, in solitary racemes as long as the leaves; pedicels opposite; calyx longer than the 2 appressed bracts at base; legumes pendulous; seeds reniform. A very beautiful species, often cultivated, on account of its splendid scarlet, rarely white, blossoms; but its fruit is not as much esteemed as that of the last. *An*.

5. *P. lunatus*.

Lima Bean.

Stem twining; leaflets ovate-deltoid, acute; flowers small, whitish, in racemes longer than the leaves; pedicels in pairs; calyx longer than its 2 bracts at base; legume scimitar form, or somewhat lunate. Very common in cultivation, and highly esteemed. *July. An*.

6. *P. nanus*.

Bush Bean.

Stem erect, branching, smooth; leaflets broad-ovate, acute; flowers white, calyx shorter than the 2 bracts at base; legume compressed, pendulous, rugose. A shrubby species, 1 foot high, extremely common in cultivation. Seeds mostly small, white, but varying much in size, shape and color. *June. An*.

5. *APIOS*.

Calyx campanulate, somewhat bilabiate; the upper lip of 2 very short, rounded teeth; the 2 lateral ones nearly obsolete; the lower one acute and longer; banner with a fold lengthwise in the centre, reflexed. Keel falcate, long, and with the stamens and styles at length spirally twisted. *Per*.

1. *A. tuberosa*.

Ground Nut.

Stem twining, nearly or quite smooth; leaves 5—7 foliate; leaflets ovate lanceolate, entire, more or less acute; flowers dark purple, of a peculiar leathery appearance, in dense, pedunculate, axillary racemes shorter than the leaves. The root bears numerous nutritious tubers. Low grounds and thickets. *July—Aug.*

6. *WISTARIA*.

Calyx campanulate, sub-bilabiate; upper lip with 2 short teeth; lower lip composed of 3 nearly equal ones. Banner with 2 callosities descending the claws. Wings and keel falcate. Legume torulose, stipitate, many-seeded. *Per*.

1. *W. frutescens*.

Common Wistaria.

Stem long, climbing, pubescent when young, at length smooth; leaves 9—13 foliate; leaflets ovate-lanceolate, acute, slightly pubescent; racemes long, pendulous, axillary and terminal, with large, colored, deciduous bracts; flowers large, numerous, lilac-colored; wings of the corolla with 2 auricles at base; ovaries smooth. A rapid-growing vine, with abundant splendid flowers. Native of the South and West, but common in cultivation. *May*.

7. *AMPHICARPÆA*.

Calyx tubular, campanulate, 4, sometimes 5-toothed; segments nearly equal. Petals oblong. Banner with appressed

sides. Stigma capitate. Ovary stipitate. Legume flat, 2—4-seeded. *Flowers of 2 kinds; upper ones complete, but mostly barren; those at the base of the stem apetalous and productive.*

1. *A. monoïca.**Wild Pea-vine.*

Stem slender, hairy, twining; leaves pinnately trifoliate; leaflets rhombic-ovate, acute, smooth; upper and perfect flowers nodding, in axillary racemes no longer than the leaves, purplish-white; lower imperfect flowers on radical peduncles; cauline legumes 3—7-seeded; radical ones often beneath the surface, 1-seeded. A very delicate vine in low woods and thickets. *July—Sep. An.*

8. *ROBINIA.*

Calyx short, campanulate, 5-toothed; 2 upper segments more or less cohering, shorter. Banner large. Keel obtuse. Stamens diadelphous. Style bearded on the inside. Legume compressed, many-seeded, nearly sessile. Trees and shrubs.

1. *R. pseudo-acácia.**Locust Tree.*

Branches with stipular prickles; prickles mostly 8 together; leaves 9—19-foliate; leaflets ovate, or oblong-ovate, thin, mucronate, smooth, paler beneath; flowers large, white, numerous, fragrant, in axillary, pendulous racemes which are 8'—5' long; legumes smooth. A beautiful tree with elegant foliage and abundant showy flowers. Native of the South and West, but naturalized in N. England and N. York. *May—June.*

2. *R. viscosa.**Clammy Locust.*

Stipular spines very short; branchlets, petioles and legumes, glandular-viscid; leaves 11—15-foliate; leaflets ovate; flowers numerous, rose-color, without fragrance, in crowded racemes. An ornamental Southern tree, common in cultivation at the North. *May—June.*

3. *R. hispida.**Rose-acacia.*

Stipular spines scarcely any; branches, calyx and legumes, hispid; flowers large, deep rose-color without fragrance, abundant, in loose and somewhat erect racemes. A very ornamental shrub, 3—4 feet high. Native at the South, Very common in cultivation. *May.*

9. *TEPHRÒSIA.*

Calyx with 5 nearly equal teeth. Bracteoles none. Banner large, round, spreading, or reflexed. Keel obtuse, cohering with the wings. Stamens in 1 or 2 sets. Legume commonly sessile, much compressed, many-seeded. *Per.*

1. *T. Virginiana.**Goat's Rue.*

Villous; stem simple, erect; leaves sub-sessile, 17—29-foliate; leaflets oblong, more or less acute, mucronate, softly villous beneath; racemes terminal, oblong, nearly or quite sessile; flowers large, pale yellow and purple; legumes falcate, villous.—An exceedingly beautiful plant, growing in sandy soils. Not very common, stems 1—2 feet high. *July.*

10. *TRIFOLIUM.*

Calyx tubular, campanulate, 5-cleft, persistent. Petals more or less united at base, withering. Banner larger than the wings, reflexed. Wings oblong, mostly longer than the keel. Legume small, membranaceous, indehiscent, included in, and scarcely longer than the calyx, 2—4-seeded. Seeds sub-globose. *Leaves trifoliate. Flowers in dense heads.*

1. *T. repens.**White Clover.*

Smooth; stem creeping, spreading; leaflets obcordate, denticulate; petioles long, semi-terete; stipules narrow-lanceolate, scarious; heads globose, on long axillary, angular peduncles; corollas white, becoming pale brown, very fragrant, reflexed when past flowering; calyx-teeth unequal, shorter than the tube; legume 4-seeded. A very common Clover in damp soils, flowering the entire season. *Per.*

2. *T. arvense.**Rabbit's-foot Clover.*

Silky-pubescent; stem erect, branching; leaflets oblong-obovate, minutely 3-toothed at apex; petioles very short; stipules ovate-lanceolate; flowers pale red or whitish, in cylindrical, very hairy heads, calyx-teeth fringed with hairs much longer than themselves. A small hairy plant, 8'—8' high, not uncommon in pastures and dry soils. *July—Aug. An.*

3. *T. pratense.**Red Clover.*

Stems assurgent, hairy, slightly pubescent; petioles pubescent; leaflets

ovate, nearly or quite entire, with a large, lighter-colored spot in the centre, emarginate; stipules ovate-lanceolate, membranaceous, acuminate, strongly nerved; flowers red, never reflexed, in dense, short, fragrant heads. A common and beautiful species, often cultivated for hay; blooming all summer. Introduced. *Per.*

11. *MELILÛTUS.*

Calyx tubular, persistent, 5-toothed. Corolla deciduous. Banner longer than the wings. Keel-petals completely united, cohering with the wings. Style terminal, filiform. Stamens in 2 sets (9 and 1). Legume coriaceous, longer than the calyx 1—few seeded.

1. *M. officinalis.**Yellow Mellilot Clover.*

Stem erect, branching, smooth; leaves pinnately 8-foliate; leaflets obovate-oblong, obtuse, remotely serrate; stipules setaceous; flowers yellow, in loose, axillary racemes, corolla twice as long as the calyx; legume ovate, 2-seeded. A very fragrant annual plant 2—3 feet high, found in alluvial soils. Introduced. *June—Aug.*

2. *M. leucantha.**White Mellilot Clover.*

Stem furrowed, smooth, branched; leaflets ovate-oblong, truncate at apex, remotely serrate; stipules setaceous; flowers white, in long, loose, axillary, racemes; corolla more than twice as long as the calyx; legume ovate, 2-seeded. A fragrant plant, 2—4 feet high, much resembling the last, but easily distinguished by the color of the flowers, and longer racemes. Alluvial meadows, also in waste places, and round old houses. Introduced. *June—Aug. Biennial.*

12. *MEDICAGO.*

Calyx 5-cleft, somewhat cylindric. Keel of the corolla remote from the standard. Legume falcate, or spirally coiled, usually many-seeded.

1. *M. lupulina.**None such.*

Stem procumbent, angular, more or less pubescent; leaves trifoliate; leaflets obovate, serrulate, mucronate; stipules lanceolate, acute, nearly entire; flowers small, yellow, in small ovate heads, on slender, pubescent peduncles, longer than the petioles; legumes reniform, 1-seeded, rugose. A common plant in fields and roadsides, with clover-like foliage, and yellow flowers. Introduced. *May—Oct. Biennial.*

13. *DESMÓDIUM.*

Calyx with 2 bracteoles at base, bilabiate, 5-cleft. Corolla inserted on the calyx at the base. Banner roundish. Keel obtuse. Stamens diadelphous (9 and 1), sometimes monadelphous. Style filiform. Stigma capitate. Legume (loment) compressed, composed of several, 1-seeded, separate joints. Leaves pinnately trifoliate. *Per.*

1. *D. nudiflorum.**Scape Trefoil.*

Stem erect, leafy at summit; leaflets rhombic-ovate, acuminate, somewhat glaucous beneath; flowers small, in radical and scape-like, paniculate racemes, purple; stamens monadelphous; legume with obtusely triangular joints. A common and well marked species, distinguished by its radical scapes, which are 1—2 ft. high, with a long raceme of purple flowers. Woods. *July—Aug.*

2. *D. acuminatum.**Bush Trefoil.*

Stem erect, simple, pubescent, leafy at summit; leaves long-petiolate; leaflets broad-ovate, terminal one rhomboidal, all conspicuously acuminate; flowers small, pale purple, in a long, terminal, loose, raceme-like panicle, on a very long, slender peduncle; legumes with about 3 triangular joints. Woods, common. About a foot high, with a panicle 1—2 ft. long. *July—Aug.*

3. *D. Canadense.**Canadian Trefoil.*

Stem erect, branching, hairy, striate; leaves on short petioles; leaflets oblong-lanceolate, nearly glabrous; stipules subulate; bracts ovate-lanceolate, ciliate, conspicuous; flowers purple, in axillary and terminal racemes; legume 3—5 jointed; joints obtusely triangular, hispid. A fine showy species in dry woods, 2—4 ft. high. *July.*

4. *D. canescens.**Hoary Trefoil.*

Stem erect, branching, hairy, striate, scabrous; leaflets ovate, more or less acute, scabrous, pubescent on both sides; stipules large, ovate, oblique, ciliate, finely striate, persistent; panicle terminal, very large, naked, densely canescent; bracts deciduous, ovate-lanceolate; flowers small, violet-purple, becoming greenish when withering; loment with about 4 oblong-triangular,

hispid joints. An upright branching species in damp woods and along rivers, growing 2–4 ft. high. *July–Aug.*

5. *D. Dillèni.*

Scabrous Trefoil.

Stem erect, branching, hairy; leaflets oblong, villous and pale beneath; stipules subulate; panicle large, naked, with scabrous but not canescent branches; flowers small, purple, becoming greenish; legumes with 2–4 rhomboidal, reticulated joints. Moist soils, growing about 3 ft. high. Distinguished from the last by its stipules and its panicles not being canescent, and its different legumes. *Aug.*

6. *D. cuspidatùm.*

Large Trefoil.

Stem erect, smooth, with few branches; leaflets ovate, or ovate-lanceolate, acuminate, smooth; stipules lanceolate, with subulate points; flowers large, purple, in a terminal few-branched panicle; bracts conspicuous, ovate, cuspidate; legumes about 6-jointed; joints oblong-triangular. The largest species described, growing 4–6 ft. high. In woods. *Aug.*

7. *D. Marilándicum.*

Smooth Trefoil.

Stem erect, slender, nearly or quite smooth; leaflets small, broad-ovate, often somewhat cordate at base, thin, mostly smooth, very obtuse; petioles short, smooth; stipules lanceolate-subulate, caducous; panicle long, terminal, with numerous, rather rough branches; flowers violet-purple, small; legumes with 1–3 semi-orbicular joints. Common in woodlands; 1–2 ft. high. *Aug.*

8. *D. ciliare.*

Hairy Trefoil.

Stem erect, hairy, mostly simple; leaves crowded on short, hairy petioles; leaflets roundish-ovate, obtuse, sub-coriaceous, more or less pubescent, somewhat ciliate; stipules linear-subulate, caducous; flowers violet-purple, small, in long, terminal panicles, with the lower branches very long; legumes with 2–3 hispid, semi-orbicular joints. A variable species, very much resembling the last, and often only to be distinguished from it by the short, hairy petioles. Dry fields and woods. *Aug.*

9. *D. rígídum.*

Stiff Trefoil.

Stem erect, branched, rough-pubescent; leaflets oblong-ovate, obtuse, ciliate, rough above, pubescent beneath; petioles hairy, shorter than the lateral leaflets; stipules ovate-lanceolate, ciliate, caducous; panicle composed of long, nearly erect racemes; flowers small, purple, quickly becoming greenish; legumes of 2–3 half-obovate, hispid joints. Extremely variable; distinguished from the last by its stipules, and from *D. canescens* and *D. Dellenii* by its different legumes. Woods. *Aug.*

10. *D. paniculátum.*

Clustered Trefoil.

Stem slender, erect, nearly or quite smooth; leaves on petioles shorter than the lateral leaflets; leaflets oblong-lanceolate, or linear-lanceolate, rather obtuse, thin; stipules subulate, deciduous; racemes paniculate; bracts lanceolate, hairy; flowers purple, on long, slender pedicels; legume straight, of 3–5 rhomboidal, hispid joints. A handsome species, 1–3 ft. high. In woods, common. *July–Aug.*

11. *D. rotundifólium.*

Creeping Trefoil.

Stem prostrate, hairy; petioles hairy; leaflets orbicular, hairy, ciliate; terminal one largest and somewhat rhomboidal; stipules large, broadly ovate, acuminate, reflexed, persistent; racemes axillary and terminal, with rather long peduncles; flowers light purple; legumes with 3–5 rhomboidal hispid joints. A common species in rocky woods, 2–4 ft. long. *Aug.*

14. *LESPEDEZA.*

Calyx 5-cleft, with 2 bracteoles at base, and nearly equal to its segments. Keel-petals very obtuse, on slender claws. Legume lenticular, mostly flat, small, reticulated, unarmed, indehiscent, 1-seeded. *Leaves trifoliate. Per.*

* *Flowers all perfect.*

1. *L. capitata.*

Headed Bush Clover.

Stem erect, mostly simple, villous; leaves crowded, on short petioles; leaflets elliptical, rather coriaceous, silky beneath; flowers in axillary racemes, on pubescent peduncles shorter than the leaves; corolla white, scarcely longer than the very hairy calyx. A common, somewhat shrubby plant, 2–3 ft. high. Dry fields and hills. *Aug.–Sep.*

2. *L. hirta.*

Hairy Bush Clover.

Stem erect, branching, villous and pubescent; leaves on very short, hairy petioles; leaflets mostly roundish-oval, emarginate, hairy, especially beneath; flowers in axillary racemes, on pubescent peduncles, which are at length much

longer than the leaves, crowded; corollas reddish-white, about as long as the calyx. Dry soils, 2–3 ft. high. *Aug.–Sep.*

** *Flowers partly perfect, partly apetalous; the latter usually bearing the fruit.*

3. *L. procúbens.*

Running Bush Clover.

Stems prostrate, pubescent, with assurgent branches; leaves on short, pubescent petioles; leaflets oval, or elliptical, mostly retuse, pubescent beneath; perfect flowers, light purple, in short, racemose heads, on axillary, very long, slender, pubescent peduncles; lower ones apetalous, on short peduncles, or subsessile; legumes, sub-orbicular. A hairy, prostrate plant, with stems 2–3 ft. long, several from the same root. Not uncommon in dry grounds and woods. *August.*

4. *L. violácea.*

Bush Clover.

Stem erect or diffuse, branching, pubescent, leaves on short petioles; leaflets varying from narrow-oval to linear, hairy beneath, equalling, or longer than the petiole; flowers in axillary, few-flowered racemes, sometimes on longer, slender ones, violet-purple; apetalous flowers glomerate and subsessile in the axils of the leaves; legumes much longer than the calyx. An extremely variable, handsome, bushy species. In woods. *Aug.–Sep.*

The following varieties are by some Botanists considered species. *Var. sessiliflora* has the flowers aggregated on peduncles shorter than the leaves; those at base chiefly apetalous and fertile; leaflets oblong, or elliptical.

Var. angustifolia is slender, smooth, with the flowers aggregated toward the extremities of the branches, the leaflets narrowly oblong, or linear.

15. *CROTOLARIA.*

Calyx 5-cleft, somewhat bi-labiate. Standard large, cordate. Keel falcate, acuminate. Stamens 10, monadelphous. Sheath of the filaments cleft on the upper side. Legumes turgid, with ventricose valves.

1. *C. sagittális.*

Rattle-pod.

Erect, hairy, branching; leaves lanceolate, or oval, entire, rounded at base, very shortly petioled; stipules united and decurrent on the stem, so as to appear reversely sagittate; peduncles short, about 3-flowered; flowers yellow; corolla shorter than the sepals; legume inflated; hollow, with a few shining seeds, which at length become loose and rattle; hence its common name. An annual, hairy plant 5'–12' high, in sandy soils. *July.*

16. *LUPINUS.*

Calyx deeply bi-labiate; upper lip 2-cleft; lower entire or 3-toothed. Banner with the sides reflexed. Wings united toward the summit. Keel falcate, acuminate. Stamens monadelphous; the sheath entire. Anthers alternate, oblong and globose. Legume coriaceous, oblong, compressed. *Leaves palmately, 5–15 foliate.*

1. *L. perénis.*

Wild Lupine.

Stem herbaceous, slightly pubescent, erect; leaflets 7–9, oblanceolate, mucronate, soft and downy; petioles long; flowers bright blue, alternate, in terminal racemes, varying to white, pedicellate; upper lip of the calyx emarginate, lower entire. A beautiful plant, abundant in dry, sandy woods. Stem about a foot high. *Per.*

2. *L. polyphýllus.*

Garden Lupine.

Tall; stem smoothish, generally striate; leaflets 11–15, nearly smooth above, silky-pubescent beneath; flowers alternate, in long racemes; bracts lanceolate, deciduous, shorter than the pedicels; calyx-lips both nearly entire. A tall, splendid plant, 3–5 ft. high, from Oregon, but common in gardens, with white, purple, or yellow flowers.

17. *BAPTÍZIA.*

Calyx campanulate, 4–5-cleft at summit, persistent. Petals about the same length. Banner orbicular, emarginate. Stamens distinct, deciduous. Legume inflated, stipitate mostly few-seeded by abortion. *Per.*

1. *B. tinctoria.*

Indigo Weed.

Stem erect, smooth, branching; leaves palmately trifoliate, on short petioles; leaflets roundish-obovate, tapering at base, very obtuse at apex. Stipules and bracts setaceous, caducous; flowers rather small, yellow, in few-flowered racemes, terminating the branches; legume much inflated, at length sub-globose, long-stipitate. A plant of a bluish-green aspect, 2–4 feet high, in dry fields and woods. *July–Sep.*

18. CASSIA.

Sepals 5, slightly united at base, nearly equal. Petals 5, unequal. Stamens 10, distinct; the upper 3 commonly with sterile anthers. Legume many-seeded.

1. *C. Marilandica.**Wild Senna.*

Glabrous; stem erect, terete, striate; leaves 12–18 foliate; leaflets oblong-lanceolate, mucronate, with a clavate gland at base of the common petiole; stipules linear-subulate, caducous; flowers bright-yellow, numerous, in axillary racemes and terminal panicles; legumes linear, at length nearly smooth; anthers blackish. A fine plant 4–6 ft. high, growing in alluvial soils, not uncommon. *July–Aug. Per.*

2. *C. Chamæchrista.**Partridge Pea.*

Stem erect, or decumbent, smooth or hairy, branching; leaflets in 8–12 pairs, narrow, oblong, obtuse, mucronate; gland at base of the common petiole sub sessile; stipules and bracts subulate, persistent; flowers large, bright-yellow, 1' in diameter, in super-axillary, subsessile fascicles of 2–4; 2 upper petals with a purple spot; anthers 10, all fertile. A beautiful species 8'–12' high, in sandy fields. Not very common. The leaves are quite sensitive. *Aug. An.*

3. *C. nictitans.**Wild Sensitive Plant.*

Erect or decumbent, slightly pubescent; stem branching; leaflets 12–30, oblong-linear, obtuse, mucronate; gland at base of the petiole slightly pedicellate; stipules and bracts subulate, persistent; flowers minute, pale yellow, in supra-axillary fascicles of 2–8; stamens 5, subequal. In dry, sandy soils, growing about 1 ft. high. Foliage very sensitive, shutting at night, and when it rains, or when disturbed by the hand. *Aug. An.*

19. GLEDITSCHIA.

Polygamous. Sepals 3–5, equal, united at base. Petals 3–5, distinct, opposite the sepals, sometimes by abortion fewer, or none. Stamens 3–5, or by abortion fewer, opposite the sepals. Styles short. Stigma pubescent. Legume compressed, often interrupted between the seeds by sweet pulp.

1. *G. triacanthos.**Honey Locust.*

Branches armed with stout, mostly branching, triple thorns; leaves abruptly pinnate, or bipinnate, often both in the same specimen; leaflets alternate, oblong-lanceolate, obtuse; flowers small, white, spicate; pods long, flat, curved, pendulous. A handsome thorny tree. Native in Penn., and the South and West. Common in cultivation, and admired for its elegant foliage. *June.*

ORDER XLIV. Rosaceæ.—Rose-family.

SYNOPSIS OF THE GENERA.

SUB-ORDER I. Amygdalæ.

Calyx free from the ovary. Style 1, deciduous. Fruit a drupe. Trees and shrubs.

1. *CÉRASUS.* Drupe smooth, destitute of a glaucous bloom. Stone or nucleus nearly globose. *Cherry.*

2. *PRUNUS.* Drupe smooth, usually with a glaucous bloom. Stone compressed. *Plum.*

3. *ARMENIACA.* Drupe pubescent. Stone compressed, smooth, with furrowed margins. *Apricot.*

4. *PÉRICA.* Drupe pubescent, rarely smooth. Stone sub-compressed, roughly furrowed. *Peach.*

SUB-ORDER II. Rosaceæ.

Calyx free from the ovaries, but sometimes inclosing them. Styles few to many, rarely single. Fruit composed of follicles or achenia. Herbs or shrubs.

* Fruit follicular.

5. *SPIRÆA.* Calyx 5-cleft. Petals roundish. Follicles 3–12.

6. *GALLIENIA.* Calyx somewhat tubular, 5-cleft. Petals linear-lanceolate, long, unequal. Follicles 5.

** Fruit consisting of achenia not inclosed in the calyx-tube.

7. *RŪSUS.* Petals 5, round, white or purplish. Achenia pulpy, drupeaceous, arranged on a conical, spongy receptacle. Leaves simple or 3–5 parted.

8. *FRAGARIA.* Petals 5, obcordate, white. Achenia dry, smooth, scattered on the enlarged, pulpy, deciduous receptacle. Leaves trifoliate.

9. *POTENTILLA.* Petals obcordate, yellow, or white. Achenia numerous, forming a head on the dry, persistent receptacle. Leaves palmately or pinnately compound.

10. *WALDESTEINIA.* Petals obtuse, yellow. Achenia few, dry, on a short receptacle. Leaves trifoliate.

11. *GEUM.* Petals 5, obtuse or emarginate. Achenia cordate, with the long,

persistent styles, aggregated on the conical, dry, receptacle. Leaves mostly interruptedly pinnate.

14. *KÉRRIA.* Petals orbicular, obtuse, yellow. Leaves simple.

*** Ovaries included in the calyx-tube.

7. *AGROMONIA.* Calyx-tube turbinate, dry, armed with hooked bristles. Herbs.

18. *RŌSA.* Calyx urceolate; tube fleshy in fruit. Achenia bony. Prickly shrubs.

SUB-ORDER III. POMEÆ.

Calyx adhering to, and including the ovaries, fleshy, juicy, and more or less globose in fruit, forming a 1–5-celled pome or berry. Shrubs or trees.

15. *CRATÆGUS.* Petals 5, orbicular. Styles 2–5. Pome consisting of 1–5 1-seeded carpels. Thorny.

16. *PYRUS.* Petals orbicular. Styles 5, rarely less. Pome fleshy, of 2–5 2-seeded carpels.

17. *AMELANCHIER.* Petals oblong-ovate, or oblanceolate. Styles 5. Pome consisting of 3–5 1-seeded carpels.

18. *CYDONIA.* Petals rounded. Styles 5. Pome consisting of 5 many-seeded carpels.

1. *CÉRASUS.*

Calyx 5-cleft, regular, deciduous. Petals spreading. Stamens 25–30. Drupe globose, fleshy, destitute of bloom. Nucleus or stone mostly globose, smooth.

1. *C. serotina.**Wild Black Cherry.*

Leaves oval or oblong, acuminate, smooth, finely serrate, shining above, petioles with 2 or more glands; flowers white in spreading, elongated, cylindric racemes; drupe black when ripe, somewhat bitter, but eatable in August and September; bark bitter, tonic. A tall, elegant tree, along fences and roadsides. Common. *May.*

2. *C. Virginiana.**Choke Cherry.*

Leaves obovate, varying to oval, abruptly acuminate, sharply serrate, generally hairy in the axils of the veins beneath; petiole with 2 glands; flowers sessile, in short, erect, spreading racemes; petals orbicular; drupes sub-globose, dark red, ripe in July and August; extremely bitter and astringent. A shrub or small tree, 5–20 feet high, in woods, and along fences. *May.*

3. *C. Pennsylvanica.**Wild Red Cherry.*

Leaves oval, varying to oblong-lanceolate, acuminate, finely serrate, smooth; flowers small, white, in sessile umbels, on long, slender pedicels; drupe ovoid-subglobose, red, very acid, ripe in July and August. A small, symmetrical tree, in woods and thickets. Common. *May.*

4. *C. sylvestris.**Cherry.*

Leaves oblong-ovate, acuminate, hairy beneath; flowers large, white, in sessile umbels, on rather long pedicels; drupe ovoid-globose, somewhat cordate at base. A common fruit tree, of symmetrical growth, with erect or ascending branches, universally cultivated, and esteemed for its delicious fruit. Drupes variable in size and color. *May.*

5. *C. vulgaris.**Morello Cherry.*

Leaves ovate-lanceolate, acute at apex, tapering at base, nearly smooth; flowers large, white, in sub-sessile umbels, with short pedicels; drupes globose. A small tree with spreading branches, often cultivated for its fruit, which is red, of various shades, and acid, or sub-acid. *April.*

2. *PRUNUS.*

Calyx 5-cleft, regular, deciduous. Petals much spreading. Stamens 15–30. Ovary with 2 ovules. Drupe ovate, or oblong, fleshy, smooth, usually covered with a glaucous bloom. Nucleus or stone compressed, smooth, acute, with somewhat grooved margins.

1. *P. Americana.**Wild Plum.*

Leaves oval, varying to ovate, or obovate, abruptly and conspicuously acuminate, sharply and often doubly serrate; flowers white, in sessile umbels; drupe roundish-oval, red and orange, mostly without bloom, very smooth, sweet and pleasant to the taste, with yellow pulp, and a thick tough skin, ripe in July and August. A straggling shrub, 8–10 feet high, with somewhat thorny branches. Not uncommon on the banks of rivers. *May.*

2. *P. maritima.**Beach Plum.*

Leaves oval or obovate, sometimes ovate, generally slightly acuminate, finely and sharply serrate; petioles with 2 glands; flowers white, in few-flowered umbels, with short, sub-pubescent pedicels; drupes nearly round, eatable, red or purple, covered with a glaucous bloom, ripe in August and September. A low shrub, 2–6 feet high, with thorny branches, on sandy shores, flowering in *May.*

3. *P. doméstica.**Plum.*

Leaves oval or ovate-lanceolate, acute; flowers white, generally solitary, pedicellate; drupe ranging from nearly or quite round, to ovoid and obovoid. A shrub or small tree 10–15 feet high, with unarmed branches. It has been long cultivated for its delicious fruit, which varies in color as well as form, being sometimes black, sometimes white, and of all intermediate colors, and is ripe from August to October. Flowers in *May*.

8. *ARMENIACA.*

Calyx 5-cleft, deciduous. Petals 5. Drupe succulent, pubescent. Nucleus or stone compressed, smooth, with furrowed margins, one obtuse and the other acute.

1. *A. vulgaris.**Apricot.*

Leaves broad ovate, acuminate, sub-cordate at base, smooth, dentuplicate; petioles with several glands at base; stipules palmate; flowers rather large, white, sessile, nearly solitary, preceding the leaves; drupe large, sub-compressed, nearly round. A small tree 10–15 feet high, often cultivated in gardens. The fruit is delicious, of a purplish-yellow color, ripe in July and August. *Ap.*

4. *PÉRISICA.*

Calyx tubular, deciduous, 5-cleft. Petals 5. Drupe fleshy, pubescent or smooth. Nucleus or stone sub-compressed, ovate, acute, rugosely furrowed on the surface.

*P. vulgaris.**Peach.*

Leaves lanceolate, serrate, with acute serratures; flowers rose-color, solitary, sub-sessile, preceding the leaves; drupe tomentosa. A small tree, 10–20 feet high, universally cultivated for its fruit, which is 1'–3' in diameter, white or yellow mingled with red, with yellow or white flesh. Ripe in July–October. Flowers in *May*.

Var. *laevis*; drupe smooth.*Nectarine.*5. *SPIRÆA.*

Calyx 5-cleft, persistent. Petals 5, roundish, equal. Stamens 10–50. Carpels 3–12, distinct, follicular, 1-celled, 2-valved, 1–10-seeded. Styles terminal.

1. *S. tomentosa.**Hardhack.*

Stem shrubby, brittle, woolly-tomentose and rust-colored; leaves ovate, or oblong, on short petioles, numerous, ferruginous-tomentose beneath, unequally serrate; racemes short, dense, numerous, aggregated into a dense, virgate panicle; flowers pale purple, very small, numerous; stamens exsert. A common shrub, 2–3 feet high, in pastures and low grounds. *July*.

2. *S. salicifolia.**Meadow-sweet.*

Nearly smooth; leaves oblong-ovate, or lanceolate, sharply, and sometimes doubly serrate, on very short petioles; flowers white, often tinged with red, arranged in dense, terminal panicles; carpels 5, smooth. A common and beautiful shrub, in meadows and low grounds, 2–4 feet high, with variable leaves, and brittle, purplish stems. *July–Aug.*

3. *S. hypericifolia.**St. Peter's Wreath.*

Nearly glabrous; leaves obovate-oblong, obtuse, attenuate at base to a petiole, entire, or somewhat toothed, stipulate; flowers white, in pedunculate corymbs, or sessile umbels. A cultivated shrub, 3–8 feet high. *May*.

4. *S. opulifolia.**Nine-bark.*

Nearly glabrous; leaves roundish, 3-lobed, doubly serrate, petiolate; flowers white, in pedunculate corymbs resembling umbels; pedicels filiform; carpels 3–5, longer than the calyx when in fruit, purple. A very elegant shrub, occasionally met with along the banks of streams, becoming quite common in cultivation. *June*.

5. *S. ulmaria.**Double Meadow-sweet.*

Herbaceous; leaves interruptedly pinnate, 3–7 foliate; lateral leaflets ovate-lanceolate; terminal ones much larger, palmately 5–7-lobed; all doubly serrate, and tomentose beneath; stipule reniform, serrate; flowers white, in a corymbose, long-pedunculate panicle. Common in cultivation, where the flowers are mostly double. *July. Per.*

6. *GILLÉNIA.*

Calyx tubular-campanulate, with the orifice somewhat contracted, 5-cleft. Petals 5, linear-lanceolate, very long and unequal. Stamens 10–15. Carpels 5. Styles filiform, terminal. Follicles 3, 2-valved, 2–4-seeded. *Per.*

1. *G. trifoliata.**Indian Physic.*

Stem shrubby at base, slender, and nearly smooth, branching; leaves 3-foliate, subsessile; leaflets ovate-oblong, acuminate; stipules linear, setaceous, entire; flowers rose-color, or nearly white, axillary and terminal, on long pedicels, in pedunculate, corymbose panicles; root emetic and cathartic. A handsome plant, 2–3 feet high, in woods. Western N. York. *June–July*.

7. *AGRIMONIA.*

Calyx-tube turbinate, armed with hooked bristles above, contracted at the throat, with a 5-cleft limb. Petals 5. Stamens 12–15. Ovaries 2. Styles terminal. Achenia included in the indurated rim of the calyx. *Per.*

1. *A. eupatori.**Agrimony.*

Stem erect, hirsute, branching; leaves interruptedly pinnate, 5–7-foliate, upper ones 3-foliate; leaflets ovate, oval, or oblong-lanceolate, coarsely toothed; stipules large, coarsely dentate; flowers yellow, in virgate spikes, on very short pedicels; petals twice as long as the calyx. A common, hairy plant, 2–4 feet high. Borders of woods and fields. *July*.

8. *GEUM.*

Calyx deeply 5-cleft, with 5 alternate, smaller, and exterior segments, or bracteoles. Petals 5. Stamens numerous. Achenia numerous, aggregated on the conical, or cylindrical, dry receptacle, caudate with terminal, persistent, bearded styles. *Per.*

1. *G. rivale.**Water-Avens.*

Stem erect, nearly or quite simple, pubescent; radical leaves interrupted and lyrate pinnate; cauline ones 3-foliate, or 3-lobed; stipules ovate, acute; flowers few, purple, nodding; calyx greenish-purple; petals purplish-yellow, broad, obovate, emarginate, abruptly unguiculate. A handsome plant, common in bogs and wet meadows, with rather large, nodding flowers. *June*.

2. *G. strictum.**Yellow Avens.*

Stem erect, hispid at base, hirsute above, dichotomous at summit; radical leaves interruptedly pinnate, the leaflets incisely lobed and serrate; cauline ones 3–5 foliate, leaflets rhombic-ovate, or oblong, lobed and incised; flowers numerous, rather large, yellow; petals larger than the calyx; style, except the hairy upper joint, smooth; receptacle densely pubescent. A stout species, 2–3 feet high, in fields, especially in N. N. Eng. and N. York. *July–Aug.*

3. *G. Virginianum.**White Avens.*

Stem erect, pubescent, more or less branched; radical leaves pinnate, or ternate, or rarely simple, cauline ones 3–5-foliate, or lobed, dentate or serrate, somewhat pubescent, or smooth; flowers small, white, erect; petals wedge-obovate, equalling the calyx; style smooth; receptacle densely hirsute. A common species, 1–2 feet high, in thickets, and along fences. Leaves very variable; upper ones often simple, and nearly entire. *July*.

9. *POTENTILLA.*

Calyx 4–5-cleft, with 4–5 alternate, exterior segments, or bracteoles. Petals 4–5, dentate, deciduous. Stamens numerous, with very slender filaments. Ovaries numerous, collected into a head, on a persistent, dry receptacle. Styles deciduous. Achenia numerous. *Per.*

1. *P. Norvégica.**Norwegian Cinquefoil.*

Hirsute; stem erect, dichotomous above; leaves palmately 3-foliate, entire, on very short petioles; leaflets numerous, obovate, becoming lanceolate above, coarsely serrate, petiolulate; flowers yellow, in leafy cymes; petals emarginate, shorter than the lanceolate, acute sepals. A common species, 1–3 feet high, in pastures and waste places. *July–Aug.*

2. *P. Canadensis.**Five-finger.*

Hirsute-pubescent; stems sarmentose, procumbent and ascending; leaves palmately 3–5-foliate; leaflets obovate, silky beneath, especially when young, incisely toothed toward the apex; stipules 2–3-cleft, or entire; flowers yellow, on axillary, solitary, elongated pedicels; calyx-segments shorter than the bracteoles, and rather shorter than the petals. A very common and variable species, sporting into apparently distinct varieties under the influence of different soils. *April–Aug.*

The most common varieties are—

Var. *pumila*—very small and delicate. In dry soils, flowering in *April* and *May*;

Var. *simplex*—less hairy; stem erect, or ascending at base, often sarmentose at apex; leaflets oblong-cuneiform; stems $\frac{1}{2}$ –2 feet long. Found in rich, moist soils, flowering from *June to Aug.*

3. *P. argentea*. *Silvery Cinquefoil.*

Stems ascending, hoary-tomentose; leaves palmately 3–5-foliate; leaflets oblong-cuneiform, pinnatifidly incised, entire at base, with a revolute margin, silvery-canescens beneath; flowers small, yellow, in crowded, terminal corymbs; petals longer than the canescent sepals. A common and pretty species, in barren fields and on rocky hills. *June–Sept.*

4. *P. fruticosa*. *Shrubby Cinquefoil.*

Stem erect, shrubby, hairy, very branching; leaves 5–7-foliate, on short petioles; leaflets oblong-lanceolate, entire, crowded, silky-pubescent, especially beneath; flowers large, yellow, in terminal clusters; petals suborbicular, longer than the calyx. A very bushy shrub, 1–2 feet high, found in meadows in the Northern States. *June–Sept.*

10. FRAGARIA.

Calyx concave, deeply 5-cleft, with 3 alternate, exterior segments, or bracteoles. Petals 5, obcordate. Stamens numerous. Achenia dry, smooth, scattered on the enlarged, pulpy, deciduous receptacle. Leaves trifoliate. Stems stoloniferous. *Per.*

1. *F. Virginiana*. *Field Strawberry.*

Plants pubescent; leaflets oval, coarsely serrate, rather coriaceous; flowers white, on few-flowered scapes, shorter than the leaves; fruit roundish-ovoid; achenia imbedded in pits on the receptacle; calyx spreading in fruit. A well-known plant, in fields and meadows, universally a favorite for its delicious fruit, which, when ripened in the sun, is scarcely surpassed in flavor by the cultivated species, and rivals it in sweetness; ripe in *June and July*. Flowers in *April and May*.

2. *F. vesca*. *English Strawberry.*

Plant pubescent, leaflets oval, coarsely serrate, or dentate; flowers white, on scapes usually longer than the leaves; achenia scattered in the surface of the conical, or semi-spherical fruit, which is *not* pitted; calyx of the fruit much spreading, or reflexed. Not uncommon in woods and fields, in the Northern States, and very common in cultivation. Distinguished from the last, which it closely resembles, by the fruit not being pitted, and the peduncles being generally longer than the leaves. *April–May.*

11. WALDSTEINIA.

Calyx 5-cleft, with 5 alternate, sometimes minute and deciduous bracteoles. Petals 5, or more, sessile, deciduous. Stamens numerous, inserted into the calyx, with filiform filaments. Achenia few, dry, inserted on a short receptacle. *Per.*

1. *W. fragarioides*. *Dry Strawberry.*

Leaves trifoliate, with pubescent petioles; leaflets broadly cuneiform, crenately toothed, and incised; scapes bracteate, many-flowered; flowers yellow; petals obovate, longer than the calyx-segments. An elegant plant, in shady and hilly woods, with dark green foliage. Rhizoma thick, and of a blackish color. Most common in N. N. Eng. and N. York. *June.*

12. RŪBUS.

Calyx 5-parted, spreading. Petals 5, deciduous. Stamens numerous, inserted on the border of the disk. Ovaries numerous, with 2 ovules, 1 abortive. Achenia persistent, pulpy and drupaceous, aggregated on a conical, or cylindrical, juicy, deciduous receptacle, so as to form a compound berry. Receptacle deciduous, separating from the axis with the fruit.

1. *R. villösus*. *High Blackberry.*

Stem mostly erect, angular, armed with stout, curved prickles; young branches and peduncles villous and glandular; leaves palmately 3–5-foliate; leaflets ovate, mostly acuminate, serrate, glandular-villous beneath, with prickly petioles; flowers white, in leafless racemes of 20–25; calyx acuminate, shorter than the obovate, spreading petals; fruit oblong, large, black, sweet and delicious; ripe in *Aug.* A common, prickly shrub; quite variable. Common along fences and borders of woods.

Var. *frondosus* is less glandular, and smoother, with incisely serrate leaflets; flowers about 10 in a raceme, with leafy bracts at base. *May.*

2. *R. hispídus*.

Bristly Blackberry.

Stem slender, prostrate, clothed with retrorse bristles; leaves 3-foliate, rarely quinate; leaflets somewhat coriaceous, obovate, mostly obtuse, smooth, entire toward the base, coarsely serrate; peduncles leafless, corymbose, with several flowers, often bristly with filiform pedicels; flowers small, white; petals obovate, twice as long as the spreading sepals; fruit small, dark purple, or blackish, sour. A common species with prostrate, trailing stems, in swamps and damp grounds. The leaves remain through the winter. *May–June.*

3. *R. Canadensis*.

Low Blackberry.

Stem procumbent, or trailing, somewhat prickly; leaves ternate, rarely quinate; leaflets varying from oval or rhombic-oval to lanceolate, acute, or acuminate, membranaceous, incisely and unequally serrate, mostly smooth; the common petiole pubescent, or somewhat prickly; flowers large, white, with leafy bracts, somewhat corymbose; petals obovate, twice as long as the mucronate calyx; fruit very large, black, sweet and juicy; ripe in *July and August*. A very common species in sandy fields. *May.*

** *Fruit separating from the dry, conical persistent receptacle.*

4. *R. odorátus*.

Flowering Raspberry.

Unarmed, glandular-hispid; leaves palmately 3–5-lobed, somewhat cordate at base, serrate, pubescent, the lobes acute, or acuminate; flowers large, in terminal corymbs, 1'–2' in diameter, purplish rose-color, on glandular-hispid peduncles; calyx-segments appendiculate, shorter than the orbicular petals. The upper part of the stem thickly clothed with purplish, viscid, glandular hairs. A splendid shrub, not uncommon on rocky hills, and in rocky woods, frequent in cultivation. The fruit is broad and rather flattish, red, or yellowish, and when ripe, sweet and pleasant. *June–July.*

5. *R. Idæus*.

Garden Raspberry.

Stem hispid, or covered with recurved prickles; leaves pinnately 3–5-foliate; leaflets broad-ovate, or rhomboidal, acuminate, unequally and incisely serrate, hoary-tomentose beneath, sessile, except the odd one; flowers white, corymbosely paniculate; petals entire, shorter than the tomentose, acuminate, calyx; fruit red, delicious, ripe in *July*. A common species in cultivation, admired for its fruit, of which there are many varieties in form and color. *May.*

6. *R. strigòsus*.

Raspberry.

Stem unarmed, shrubby, strongly hispid; leaves pinnately 3–5-foliate; leaflets oblong-ovate, acuminate, serrate, hoary-tomentose beneath, sessile, except the odd one, which is often sub-cordate at base; peduncles 3–6 flowered, hispid; petals white, about equal to the spreading sepals; fruit light red, juicy, of a peculiar and very pleasant flavor, ripe in *August*. A common species along fences, and in neglected fields. *May.*

7. *R. occidentális*.

Black Raspberry.

Stem shrubby, glaucous, armed with hooked prickles; leaves pinnately 3-foliate; leaflets ovate, acuminate, coarsely and doubly serrate, hoary-tomentose beneath; lateral ones sessile; peduncles axillary and terminal, the former 1–3 flowered, the latter several-flowered, with short pedicels; petals white, shorter than the reflexed sepals; fruit dark purple, covered with a glaucous bloom, roundish, of a lively pleasant flavor, ripe in *July*. A common species along fences and the border of woods, distinguished by its purple, glaucous, arching stems. *May.*

8. *R. triflorus*.

Herbaceous Raspberry.

Stem somewhat suffrutescent at base, declined, unarmed; branches slender, herbaceous, pubescent; leaves 3–5-foliate; leaflets mostly smooth, or pubescent beneath, rhombic-ovate, acute, unequally dentate, sessile, except the odd one; stipules ovate, entire; flowers white, on terminal 1–3-flowered peduncles; sepals at length reflexed; petals oblong-obovate, erect, longer than the calyx; fruit small, red. A common herbaceous species in moist woods, and shady hill-sides. The fruit is red and sour, grown in the shade, but rather pleasant when ripened in the sun. *June. Per.*

13. RŌSA.

Calyx-tube urceolate, contracted at the mouth, at length fleshy, with 5 segments, which are somewhat spirally imbricated in pre-floration. Petals 5. Achenia numerous, bony, hairy, attached to the inside of the fleshy calyx-tube. *Leaves pinnate. Shrubs.*

1. *R. Carolina*.

Swamp Rose.

* Stem smooth, armed with stout-hooked, mostly stipular prickles; leaflets 5–9, oblong, serrate, pale beneath, not shining above, petiolate; petioles

slightly hairy, or somewhat prickly; flowers 5—5, in leafy clusters at the ends of the branches, light red; calyx and peduncles glandular-hispid. A common rose, growing 4—8 feet high, in swamps. *June—July.*

2. *R. lucida.*

Wild Rose.

Stems armed with scattered, setaceous prickles, those of the stipules straight; leaflets 5—9, elliptical, sharply serrate, smooth and shining above; petioles somewhat glandular, or hispid; flowers 1—3, pale red; peduncles and appendaged calyx-segments glandular-hispid; fruit depressed, globose, small, red, hispid. A common shrub, 1—4 feet high, in dry fields, of rather slender growth, with greenish branches. Distinguished from the last by the shining upper surface of its leaves, and the straight, stipular prickles. *June—July.*

3. *R. setigera.*

Prairie Rose.

Branches elongated, ascending, glabrous, with a few, stout, somewhat hooked, stipular prickles; leaflets 3—5, large, ovate, acute, or acuminate, smooth and somewhat shining above, sharply serrate; flowers in very large, corymbose clusters, nearly scentless, of a changeable reddish color; petioles, peduncles and calyx, glandular; styles united; fruit globose. A splendid climbing species, capable of being trained 10—20 feet. Native of the South and West, but common in cultivation. *June—July.*

4. *R. rubiginosa.*

Sweet Brier.

Stem smooth, armed with stout, recurved prickles; leaflets 5—7, rounded-oval, sharply serrate, and with the petioles and stipules clothed with ferruginous glands beneath; flowers light red, or white, fragrant, mostly solitary, on hispid peduncles; fruit ovate, or obovate, reddish-orange when full grown. A stout shrub, armed with very strong prickles. Common in fields and roadsides, being naturalized; often cultivated. The foliage is very fragrant. *June.*

5. *R. cinnamomea.*

Cinnamon Rose.

Stem tall, with ascending branches; prickles of the young stems crowded, straight and unequal, the larger subulate and the smaller setaceous; those of the branches fewer, stouter, stipular and recurved; leaflets 5—7, oval-oblong, cinerous-pubescent beneath; stipules linear-oblong, those of the flowering branches dilated above, with ovate acuminate auricles; calyx-segments entire, as long as the petals; fruit smooth, globose; stem 5—10 feet high, with a bark somewhat of a cinnamon color; flowers mostly double, light red. Gardens. *June.*

6. *R. Gállica.*

French Rose.

Stem and petioles armed with numerous slender, scattered prickles; leaflets mostly 5, elliptical, or broadly oval, thick; flowers erect; petals, when single, 5, large, spreading; calyx-segments ovate; fruit ovoid, and with the peduncles, hispid. The common Rose of the gardens, the flowers varying with every tint from crimson to light red, and often variegated. *June.*

7. *R. eglantéria.*

Yellow Rose.

Stem clothed with an ash-colored bark, and with the red branches armed with straight, slender, scattered prickles; leaflets 5—7, broad-oval, or obovate, sharply serrate, smooth and shining above; flowers abundant, golden-yellow, of very short duration, fragrant, but less so than the leaves; calyx nearly naked and entire. A splendid species, 8 feet high, becoming common in cultivation. The flowers are often double, and in some varieties variegated with red. *June.*

8. *R. Damascéna.*

Damask Rose.

Stem erect, branching, bushy, armed with unequal, mostly stipular prickles, those of the stem broad and recurved; leaflets broad-elliptical, large, whitish beneath; flowers pale rose-red, very fragrant, quite profuse, generally double; sepals reflexed; fruit ovoid, elongated. A common garden species, 3—9 feet high. Native of the Levant, and especially of Damascus, where it is in the highest perfection, and from whence it has its name. The low Monthly Rose that blooms at all seasons is a variety of this.

9. *R. canina.*

Dog Rose.

Stems armed with a few stout, compressed, hooked prickles; leaflets 5—9, ovate, with acute, incurved, and often double serratures; stipules somewhat broad, serrulate; peduncles scaly, hispid; calyx-segments after flowering reflexed and deciduous; fruit red, ovoid. A common species in gardens, from which several classes of varieties have been originated by culture.

10. *R. centifolia.*

Hundred-leaved Rose.

Stem armed with very numerous prickles, which are nearly straight and, hardly dilated at base; leaflets 5—7, ovate, glandular-ciliate, and somewhat

pilose beneath; flower-bud short, ovoid; calyx-segments spreading when in flower; fruit ovoid; calyx and peduncles glandular-hispid, viscid. The flowers are usually pink, but vary exceedingly in the different varieties.

11. *R. moschata.*

Musk Rose.

Stems armed with slender hooked prickles, with climbing, unarmed branches, leaflets 5—7, lanceolate acuminate, smooth; stipules very narrow, acute; flowers paniculate, white, large, peculiarly fragrant, generally numerous peduncles and calyx somewhat hispid; calyx-segments planatifidly incised, appendiculate. A species with long trailing or climbing stems.

12. *R. álba.*

White Rose.

Stems armed with slender hooked prickles, sometimes unarmed; leaflets broad-ovate, briefly acuminate, and with the petioles, somewhat tomentose and glandular on the veins beneath; flowers large, corymbose, very fragrant, white, and when newly opened, tinged with pink; sepals pinnatifid; petals spreading; fruit ovoid, nearly smooth. A favorite species, common in gardens, 4—9 ft. high.

13. *R. multiflora.*

Multiflora Rose.

Stems armed with slender, scattered prickles, with very long, luxuriant shoots; leaflets ovate-lanceolate; stipules pectinate; flowers abundant, corymbose; flower-bud ovoid-globose, sepals short; style exsert. A climbing shrub, capable of being trained to a considerable height. The flowers vary in cultivation between white and different shades of rose.

14. *R. Índica.*

Indian Rose.

Stems erect or climbing, armed with a few stout prickles; leaflets 3—5, ovate, acuminate, coriaceous, smooth and shining, serrulate; stipules very narrow; flowers solitary, or in panicles; peduncles often somewhat incrassate, smooth, or rough-hispid; calyx smooth or hispid.

A splendid species, not yet common in cultivation, but the parent of numerous classes of varieties, with flowers of almost every conceivable hue, most of which bloom continuously through the season.

14. KÉRRIA.

Calyx of 5, acuminate, nearly distinct segments. Petals 5, orbicular. Ovaries 5—8, smooth, globose. Ovules solitary. Styles filiform. Achenia globose.

1. *K. Japónica.*

Japan Globe-flower.

Stems numerous, slender, smooth; leaves simple, ovate, long-acuminate, doubly serrate, exstipulate; flowers clustered, or solitary, on the ends of the branches, orange-yellow, globular, double and abortive in cultivation. A common shrub in gardens 5—8 ft. high. Flowering nearly all summer.

15. CRATÆGUS.

Calyx-tube urceolate, with a 5-lobed limb. Petals 5, spreading. Stamens numerous. Styles 1—5. Pome fleshy, crowned with the calyx-teeth, and containing 1—5 long, 1-seeded carpels.

1. *C. coccinea.*

White Thorn.

Leaves roundish-ovate, 5—9-lobed, sharply incised, thin and membranous, acutely serrate, truncate at base, sometimes acute, or even cordate, on slender petioles, nearly or quite smooth; flowers white, corymbed; calyx and pedicels generally smooth, sometimes pubescent; styles 3—5; fruit large, globose, bright red, eatable in September. A very common and variable shrub, or small tree, 10—20 feet high. Branches armed with stout, sharp, slightly recurved thorns. In thickets and low grounds. *May.*

2. *C. punctata.*

Thorn.

Leaves obovate, cuneiform, with slender petioles, entire at base, doubly serrate, often incised near the apex, pubescent when young, with appressed hairs, especially beneath, the corymbs and calyx villous-pubescent; flowers white, in somewhat leafy corymbs; fruit large, globose, of a dull red, or yellowish color, eatable, and rather pleasant; ripe in Sept. A small tree, 18—25 feet high, with crooked, spreading, ash-colored branches, and stout, sharp thorns. Borders of woods, especially in the northern parts of the U. S. *May.*

3. *C. tomentosa.*

Black Thorn.

Leaves oval, or elliptic-ovate, tapering at base into a margined petiole, somewhat plicate above, mostly acute, doubly serrate, and generally incisedly dentate towards the apex, nearly smooth above, tomentose beneath; flowers large, fragrant, white, in large, leafy corymbs, with calyx and pedicels villous-tomentose;

styles 3–5; fruit pyriform, ovary red, eatable, but rather inspid. A large shrub in wet thickets, growing 10–15 feet high, and armed with sharp thorns. *May*.

4. *C. Oxyacantha*.*Hawthorn*.

Leaves obovate, 3–5-lobed, incised and serrate, cruciform at base, shining, smooth; flowers white, in glabrous corymbs, with smooth pedicels; styles 1–3; fruit ovoid, deep red, or purple, small. A very branching shrub, with glabrous branches, and very slender, sharp, axillary thorns, 8–15 feet high. Common in cultivation, especially for hedges. *May*.

16. PYRUS.

Calyx urceolate, with a 5-cleft limb. Petals 5, roundish. Styles 2–5, often united at base. Pome closed, fleshy, 2–5 carpelled. Carpels cartilaginous, 2-seeded.

1. *P. Mâlus*.*Apple*

Leaves ovate, or oblong-ovate, serrate, acute, or briefly acuminate, pubescent above, tomentose beneath, petiolate; flowers large, light rose-color, mingled with white, fragrant, in somewhat umbellate corymbs; pedicels and calyx villous-tomentose; petals short, unguiculate; styles 5, united and villous at base; pome globose. A well-known fruit-tree, universally cultivated, and almost naturalized. It grows 20–40 ft. high, with crooked, spreading branches, and dark rough bark. Innumerable varieties are cultivated. *May*.

2. *P. communis*.*Pear*.

Leaves ovate-lanceolate, somewhat serrate, smooth above, pubescent beneath, acute or acuminate; flowers smaller than in the Apple, white, in racemose corymbs, with the calyx and pedicels pubescent, styles 5, distinct and villous at base; pome usually pyriform. A taller tree than the last, 20–50 ft. high, equally well known and prized. Branches ascending. As in the Apple, the varieties are numberless. *May*.

3. *P. arbutifolia*.*Choke-berry*.

Leaves oblong-ovate, obtuse, or acute, crenately serrulate, smooth and shining above, when young tomentose beneath, somewhat coriaceous; flowers in compound, terminal corymbs; calyx and pedicels tomentose when young; fruit pyriform, or nearly globose, dark-red, or purple when ripe, astringent. A low branching shrub, 2–5 ft. high, common in low grounds and borders of swamps. *May*.

4. *P. Americana*.*Mountain Ash*.

Leaves pinnate, 13–15 foliate, smooth, but, together with the petiole, pubescent when very young; leaflets oblong-lanceolate, acuminate, sharply serrate, with mucronate teeth, flowers white, in compound cymes; fruit bright red, or scarlet, globose, sour. Common in damp woods in mountainous districts, especially in the northern parts of New England. A small tree 15–25 ft. high, blossoming in *May* and *June*. Frequently cultivated.

17. AMELANCHIER.

Calyx 5-cleft. Petals oblong-ovate, or oblanceolate. Stamens short. Styles 5, more or less connected. Pome 3–5-celled, cells partly divided by a false dissepiment, with a seed in each division.

1. *A. Canadensis*.*Shad-flower*.

Leaves ovate, or oval, sometimes oblong, often cordate at base, softly tomentose when very young, smooth when fully grown, sharply serrate; flowers white, racemose; berries purple, eatable; calyx-segments triangular-lanceolate, about the length of the tube. A very common and variable shrub in damp rocky woods, and low grounds, growing 6–15 ft. high. *May*.

One of the most common varieties is var. *Oblongifolia*. Leaves oval-oblong, mucronate, serrate, with short acute teeth, tomentose on the lower surface during flowering; flowers smaller; petals obovate-oblong, about 3 times the length of the calyx. Apparently well marked while in flower, but difficult to distinguish afterwards.

18. CYDINIA.

Calyx urceolate with a 5-cleft limb. Petals 5. Styles 5. Pome with 5 cartilaginous, many-seeded carpels. Seeds covered with a mucilaginous pulp.

1. *C. Vulgaris*.*Quince*.

Leaves oblong-ovate, obtuse at base, acute at apex, entire, smooth above, woolly beneath; flowers large, solitary, on woolly peduncles; calyx woolly; petals white, tinged with red; pome soft, downy, usually obovoid, yellow when

mature. A large shrub of straggling growth, with long, very slender branchlets. The well-known fruit is universally employed for sweetmeats. *May*.

ORDER XLV. Calycanthaceæ.—*Calycanthus*-tribe.

1. CALYCANTHUS.

Lobes of the calyx and petals passing into each other, imbricated in several series, lanceolate, colored, somewhat coriaceous or fleshy. Stamens unequal, the 12 outer fertile.

1. *C. floridus*.*Sweet scented Shrub*.

Leaves oval or ovato-lanceolate, tomentose beneath; branches spreading; flowers lurid purple, almost sessile. A shrub 6–10 feet high, exhaling from its bark and leaves the odor of camphor, and from its flowers when wilted that of ripe apples. Native of the South, but common in gardens. It is very variable. In some varieties the leaves are smooth and glaucous beneath; in others, lanceolate, smooth beneath, and scabrous above; in others still, smooth beneath with the branches erect. *June*.

ORDER XLVII. Melastomaceæ.—*Melastoma*-family.

1. RHÆXIA.

Calyx-tube swelling at base, with a 4-cleft, persistent limb. Petals 4. Stamens 8, with 1-celled anthers. Style declined. Capsule nearly free from the investing calyx-tube, 4-celled, with prominent placentæ. *Per*.

1. *R. Virginica*.*Meadow Beauty*.

Stem somewhat hispid, with 4 slightly winged angles; leaves sessile, oval-lanceolate, sparingly hispid, ciliate-serrulate, strongly 3-nerved, rarely more; flowers large, bright purple, showy and numerous, in corymbose cymes; petals obovate, hispid beneath, deciduous; calyx hispid; anthers long, yellow, crooked. A very showy plant 6'–12' in wet ground; not uncommon. *July*–*Aug*.

ORDER XLVIII. Lythraceæ.—*Loosetrife*-family.

1. DECODON.

Calyx short, broadly campanulate, with 5 erect teeth, and 5 elongated, spreading, horn-like processes. Stamens 10, those opposite the calyx-teeth very long. Style filiform. Stigma small. Capsule globose, included in the calyx, many-seeded. *Per*.

1. *D. verticillatum*.*Swamp Loosetrife*.

Stems simple, woody at base, with recurved or reclining branches, often rooting at the summit, 4–6 angled; leaves opposite or verticillate in whorls of 3, lanceolate, entire, on short petioles; flowers purple, in axillary, nearly sessile clusters, of 3, or more, apparently verticillate, extending over the greater part of the stem. An elegant plant in swamps, with slender stems 4–6 ft. long, and showy flowers. Common. *Aug*–*Sep*. There are 2 varieties, one in Rhode Island, and further south, with the stems and under surface of the leaves pubescent, the other with the stem and leaves smooth, in other parts of New England.

ORDER XLIX. Onagraceæ.—*Evening Primrose*-family.

SYNOPSIS OF THE GENERA.

SUBORDER I. Onagraceæ proper.

Calyx-tube usually prolonged beyond the ovary; limb 4-parted. Petals 4, (usually wanting in one species of No. 4.) Stamens 8, 4, or 2. Capsule 2 or 4-celled, 2 or 4 valved.

* **Stamens 8. Petals 4.**

1. *EPILOBIUM*. Calyx-tube not prolonged beyond the ovary. Capsule linear.

2. *CENÓTHERA*. Calyx-tube prolonged beyond the ovary. Capsule oblong or oblong-clavate, 4-angled, sometimes winged on the angles.

3. *FUSCHIA*. Calyx prolonged above the ovary, petaloid. Capsule oblong or baccate, globular. *Shrubby*.

**** Stamens 2—4.**

4. *LUDWIGIA*. Petals 4, or none. Stamens 4. Capsule 4-celled, many-seeded. Leaves entire.

5. *CROZEA*. Petals 2. Stamens 2. Capsule 2-celled, 2-seeded.

SUBORDER II. Haloragææ.

Calyx-tube never longer than the ovary, the limb entire, or scarcely toothed. Petals 4, rarely present. Stamens 1—8. Capsule 1—4 celled, 1—4-seeded, indehiscent. Aquatics with minute, axillary flowers.

6. *PROSERPINACA*. Calyx-tube 3-sided. Limb 3-parted. Petals none. Stamens 3. Capsule 3-sided.

7. *MYNOPHYLLUM*. Flowers mostly monœcious. Calyx somewhat 4-parted. Petals 4, or more. Stamens 4—8.

1. EPILÔBIUM.

Calyx-tube not prolonged beyond the ovary. Limb 4-cleft, or 4-parted to the base, with spreading and deciduous segments. Petals 4. Stamens 8. Anthers attached near the middle. Stigma clavate, or with 4 lobes. Capsule linear, 4-sided, 4-celled, 4-valved. *Per.*

1. E. angustifolium.

Willow Herb.

Stem erect, simple, mostly smooth; leaves lanceolate, sessile, nearly entire, glabrous; flowers numerous, large, of a purplish lilac-color, in a long, terminal, spicate raceme; petals unguiculate; stamens and styles declined; capsules canescent. A very showy plant in low grounds and newly cleared lands, 2—6 feet high. Not uncommon. *July—Aug.*

2. E. coloratum.

Colored Willow-Herb.

Stem erect, nearly terete, very branching, puberulent; leaves mostly opposite, lanceolate, acute, very shortly petiolate, subserrulate, often with reddish veins; flowers numerous, rose-color, small; petals cleft at apex, twice as long as the sepals; stigma clavate; capsules on short pedicels, somewhat pubescent. A common plant in wet, swampy grounds; growing 1—8 feet high, very branching above. The leaves are marked with numerous white dots.

2. CENÓTHERA.

Calyx-tube prolonged beyond the ovary, the segments 4, reflexed. Petals 4, equal, obcordate or obovate, inserted into the top of the calyx-tube. Stamens 8. Capsule 4-celled, 4-valved, many-seeded. Stigma 4-lobed.

1. C. biennis.

Evening Primrose.

Stem erect, simple or branched, rough with scattered hairs; leaves ovate-lanceolate, pubescent; flowers large, yellow, in a terminal leafy spike, sessile; calyx-tube much longer than the ovary; capsule sessile, oblong, obscurely 4-angled or nearly round, often pubescent. A tall plant 3—5 feet high, with reddish stem, and large yellow flowers, which open with a strong perfume at night, or in cloudy weather, and last only one day. Common in fields and waste grounds. *June—Aug.* Very variable. *Biennial.*

2. C. pumila.

Dwarf Primrose.

Stem slender, simple, reclined at base, ascending, somewhat pubescent; leaves lanceolate, entire, obtuse, tapering at base, sessile; flowers rather small, yellow, nearly sessile, in a terminal, leafy spike; calyx-tube shorter than the ovary; petals obcordate, scarcely longer than the calyx and stamens; capsule oblong-clavate, angular, the alternate angles winged. A slender plant with declining stem, 8'—12' high, in grassy fields. Common. *Per. June—Aug.*

3. FUSCHIA.

Calyx tubular-funnel form, colored, deciduous, with a 4-lobed limb. Petals 4, inserted in the throat of the calyx, alternating with its segments. Disk glandular, 8-furrowed. Capsule baccate, oblong, obtuse, 4-sided.

1. F. coccinea.

Lady's Eardrop.

Stem shrubby, with smooth branches; leaves opposite or verticillate, in 3's, ovate, acute, denticulate, on short petioles; flowers axillary, nodding; sepals oblong, acute; petals convolute, half as long as the calyx. A beautiful shrub for the greenhouse, or house cultivation, growing 1—6 feet high, with large flowers, on long, filiform pedicels; calyx scarlet, spreading; petals convolute; violet-purple. Stamens much exsert, crimson; berry purple.

4. LUDWIGIA.

Calyx-tube not prolonged beyond the ovary, with 4-lobes, mostly persistent. Petals 4, equal; often minute, or wanting. Stamens 4, opposite the calyx-segments. Capsules short, often perforated at summit, 4-celled, 4-valved, crowned with the persistent calyx-segments. *Per.*

1. L. alternifolia.

Seedbox.

Stem erect, branching, slightly angled, nearly smooth; leaves lanceolate, or oblong-lanceolate, alternate, sub-acute, tapering at base, sessile; flowers yellow, on axillary, solitary peduncles; calyx-segments broadly ovate, acuminate, turning purple inside, fully equalling the petals; capsule 4 winged, crowned with the calyx. A common plant in swamps, 18'—25' high, with tough bark. Flowers yellow, rather large and showy, but fugacious. *July—Aug.*

2. L. palustris.

Water Purslane.

Smooth and somewhat succulent; stems procumbent; leaves opposite, ovate, entire, petiolate, acute; flowers sessile, axillary, apetalous, sometimes with small, reddish petals; capsule oblong, 4-angled, short, abrupt at both ends, and crowned with the green calyx. A little, creeping plant in muddy places, or floating in water. Common. *June—Sep.*

5. CROZEA.

Calyx-tube slightly prolonged beyond the ovary, deciduous; the limb 2-parted. Petals 2, obcordate. Stamens 2, alternate with the petals. Capsule obovate, hispid, with hooked hairs, 2-celled, at length 2-valved, 2-seeded. *Per.*

1. C. Lutetiana.

Enchanter's Nightshade.

Stem erect, branching, pubescent above; leaves opposite, ovate, somewhat cordate at base, acuminate, slightly repand-toothed; flowers small, white, or pale rose-color, in elongated, naked racemes; bracts none; calyx reflexed; fruit obcordate, covered with hooked bristles, on slender, reflexed pedicels. An elegant plant, 1—2 feet high, generally somewhat pubescent, with tumid nodes and dark green foliage. Common in damp, rich woods. *July.*

2. C. alpina. *Alpine Enchanter's Nightshade.*

Smooth; stem ascending, weak, somewhat juicy; leaves opposite, cordate, somewhat coarsely dentate, as long as their petioles; flowers small, white, rarely rose-color, in elongated racemes, with minute, setaceous bracts; capsules pubescent, but scarcely hispid. A delicate little plant, 3'—8' high, much resembling the last, but distinguished by the smaller flowers and fruit, the presence of bracts and its entire smoothness. Not uncommon in dense, damp woods. *July.*

6. PROSERPINACA.

Calyx-tube 3-sided, adhering to the ovary, with a 3-parted limb. Petals none. Stamens 3. Stigmas 3; oblong. Fruit bony, 3-sided, 3-celled, crowned with the persistent calyx. *Per.*

1. P. palustris.

Mermaid-Weed.

Stem ascending at base, striate, smooth; leaves alternate, lanceolate, sharply serrate; those below the water pinnatifid, with linear segments, and on short petioles; flowers small, green, axillary, 1—3 together, followed by a hard, triangular nut, with sharp corners. Common in shallow water shaded by thick swamps or woods, with stems 6'—12' high. *June—July.*

7. MYRIOPHYLLUM.

Flowers monœcious, or perfectly perfect. Calyx 4-toothed in the perfect and pistillate flowers, 4-parted in the sterile. Petals 4, often minute or wanting. Stamens 4—8. Fruit consisting of 4 nut-like, indehiscent carpels, cohering by their inner angles, included in the calyx-tube. *Aquatic. Per.*

1. M. spicatum.

Water Millfoil.

Leaves verticillate in 3's, pinnately parted, with capillary segments; floral leaves, or bracts shorter than the flowers, ovate, entire, the lower larger and serrate; flowers greenish, small, in terminal, nearly naked spikes; petals broad-ovate. An aquatic plant growing in deep ponds, with very long, slender, branching, submersed stems, only the spikes appearing above water. *July—Aug.*

2. M. ambiguum.

Millfoil.

Leaves alternate; submersed ones pinnately parted, with capillary segments; those near the surface pectinate; upper ones linear, entire, or slightly toothed, petiolate; flowers axillary, minute, mostly perfect; petals oblong, somewhat per-

esistent. An aquatic, with floating stems, in ponds and ditches. Not uncommon. The following variety also occurs.

Var. *limbosum*. Stem procumbent and rooting, 2'-6' long, very slender; leaves mostly entire. A very small plant in muddy places.

ORDER L. Cactaceæ.—*Cactus-tribe*.

1. OPUNTIA.

Sepals and petals numerous, united in a tube which adheres to the ovary; but is not produced beyond it. Stamens numerous, shorter than the petals. Style cylindrical, with numerous, thick, erect stigmas. Berry umbilicate at apex, tuberculate, prickly. *Per.*

1. *O. vulgaris*.

Prickly Pear.

Prostrate, creeping, with articulated branches and ovate, broad and flattened joints, with fascicles of prickles regularly arranged upon them; prickles short and numerous, each fascicle usually consisting of several strong subulate spines; flowers yellow; fruit crimson, nearly smooth, eatable. A very curious plant, found native south of Mass., in sandy fields and on rocks; quite common in cultivation. The larger spines are rarely produced at the North. *June—July.*

2. CEREUS.

Sepals very numerous, imbricated, adnate to the base of the ovary, united into a long tube, the outer shorter, the inner passing into the petals. Stamens very numerous, coherent with the tube. Style filiform, many-cleft at apex. Berry very scaly with the vestiges of the sepals. *Fleshy shrubs, with woody, cylindrical axes, that are armed with clusters of spires from which the flowers arise. Per.*

1. *C. Phyllanthus*.

Branches ensiform, compressed, serrate; flowers large, white, expanding by night, fragrant, with the round tube much longer than the limb of the petals. The branches are 2 feet long, or more.

2. *C. Phyllanthoides*.

Branches ensiform, compressed, obovate, with spreading, rounded teeth; flowers rose-color, expanding by day, arising from the lateral teeth of the branches; tube shorter than the limb of the petals.

3. *C. truncatus*.

Branching joints short, compressed, serrate, truncate at summit; flowers pink, arising from the summit of the joints; style longer than the stamens or the reflexed petals. About a foot high.

4. *C. flagelliformis*.

Snake Cactus.

Stem creeping, about 10-angled, hispid; flowers bright pink, lateral, opening by day, and lasting several days; tube slender, longer than the limb of the petals; stem about $\frac{1}{4}$ thick, and 2-4 feet long.

ORDER LI. Grossulacææ.—*Gooseberry-family*.

1. RIBES.

Character same as that of the order.

1. *R. flóridum*.

Wild Black Currant.

Leaves subcordate at base, 3-5-lobed, sprinkled on both sides with resinous dots, doubly serrate, pubescent beneath; racemes pendulous, pubescent; flowers rather large, yellowish-green; calyx cylindrical, smooth; bracts linear, longer than the pedicels; fruit ovoid-globose, smooth, black. A shrub, 3-4 feet high, not uncommon in woods and along fences. Fruit black, insipid. *May—June.*

2. *R. rubrum*.

Currant.

Leaves subcordate, obliquely 3-5-lobed, mostly pubescent beneath, especially when young, serrate with mucronate teeth; racemes nearly smooth, pendulous; flowers greenish, calyx rotate; fruit globose, smooth, red, or sometimes white. A shrub, found every where in gardens, and native in the extreme northern parts of the U. S. and north to the Arctic Ocean. It varies much in the size and color of its fruit.

3. *R. nigrum*.

Black Currant.

Leaves 3-5-lobed, punctate beneath, dentate-serrate, longer than the petioles; flowers yellowish, in lax, hairy, slightly nodding racemes; calyx campanulate; bracts nearly equal to the pedicels; fruit roundish, nearly black. A shrub, in gardens, cultivated for the medicinal jelly made from the fruit. *May.*

4. *R. aureum*.

Golden Currant.

Glabrous; leaves 3-lobed, shorter than the petioles; lobes divaricate, entire, or with a few teeth; flowers numerous, golden yellow, very fragrant, in lax, many-flowered racemes; calyx tubular, longer than the pedicels; fruit smooth, oblong or globose, yellow, at length brown, pleasant. A beautiful shrub, native of Missouri, common in cultivation, and a favorite for its ornamental and fragrant flowers.

5. *R. Cynósbati*.

Prickly Gooseberry.

Stems unarmed or prickly; subaxillary spines mostly in pairs; leaves roundish-cordate, 3-5-lobed, pubescent, especially when young; the lobes incisedly serrate; racemes loose, nodding, few (2-3) flowered; flowers yellowish-green; calyx-tube cylindrical; segments at length reflexed, shorter than the tube, and longer than the obovate petals; fruit prickly. A shrub, 3-4 feet high, not uncommon in the Northern States, along fences and in woods, usually with unarmed stems. Fruit brownish-purple, eatable. *May—June.*

6. *R. hirtellum*.

Wild Gooseberry.

Stem unarmed; subaxillary spines short, mostly solitary; leaves roundish, deeply 3-5-lobed, nearly smooth, pubescent beneath when young, shining above, incisedly toothed; peduncles smooth, 1-3-flowered; flowers white; calyx cylindrical; segments twice as long as the tube; petals spatulate, unguiculate; stamens exsert, smooth, twice as long as the petals; fruit smooth. Not uncommon in low woods. Stem 2-4 feet high.

7. *R. Ûva-crispa*.

English Gooseberry.

Stem prickly; leaves roundish, 3-5-lobed; pubescent beneath, on short, hairy petioles; peduncles hairy, 1-flowered; flowers whitish; calyx campanulate; style and ovary hairy; fruit smooth or hairy, globose. Very frequent in cultivation, with many varieties, both in the size and color of the fruit, which is red, white, green, or yellow, and often weighs more than an ounce. *April.*

ORDER LII. Passifloracææ.—*Passion-flower-family*.

1. PASSIFLORA.

Calyx campanulate at base, 5-cleft, the throat with a conspicuous filamentous crown. Petals 5, sometimes none. Stamens 5, connate with the stipe of the ovary. Anthers large, elongated. Stigmas 3, clavate, capitate. Fruit pulpy, baccate.

1. *P. cœrulea*.

Passion-flower.

Stem shrubby, climbing; leaves palmately and deeply 5-parted; segments oblong-linear, entire, all but the terminal one, which is often 2-lobed; flowers large, blue outside, white and purple within; petals glandular, with an involucre of 8 entire bracteoles, near the flower; filaments of the crown shorter than the petals. A shrubby climber, not uncommon in cultivation, and admired for its large, beautiful, but evanescent, flowers, which last but a day.

ORDER LIII. Cucurbitacææ.—*Pumpkin-tribe*.

1. SICYOS.

Flowers monœcious. STERILE FLOWERS—Calyx 5-toothed; teeth subulate or minute. Corolla rotate, consisting of 5 nearly distinct segments. Stamens 5, monadelphous, or at length separating into 3 parcels. Anthers contorted. FERTILE FLOWERS—Calyx campanulate, 5-toothed, contracted above. Petals 5, united below into a campanulate corolla. Fruit ovate, membranaceous, hispid or echinate with spiny bristles. Seed large, compressed. *An.*

1. *S. angulatus*.

Wild Cucumber.

Stem climbing by tendrils, branching, hairy; leaves roundish, cordate at base, 5-angled, 5-lobed; lobes acuminate, denticulate; tendrils 3-5-cleft; flowers whitish, marked with green lines; sterile ones in crowded racemes, on

long peduncles; *fertile* ones on short peduncles, smaller; both usually from the same axils; fruit somewhat spiny, in crowded clusters, each containing 1 large seed. A climbing vine, on the borders of rivers and streams; sometimes cultivated, and thence straying into waste grounds. *July*.

2. CUCUMIS.

Flowers monœcious or perfect. Calyx tubular-campanulate. Segments subulate. Corolla deeply 5-parted. STERILE FLOWERS—Stamens 5, triadelphous. FERTILE FLOWERS—Style short. Stigmas thick, 2-parted. Pepo fleshy, indehiscent. Seeds ovate, without margins, compressed. *An.*

1. C. sativus.

Cucumber.

Stem rough, prostrate and trailing; tendrils simple; leaves somewhat cordate, palmately 5-angled or lobed; lobes nearly entire, acute; the terminal one longest; fruit oblong, obtusely-angled, on a short peduncle, prickly when young; flowers yellow, solitary, axillary. Universally cultivated for its green fruit, which is either prepared and eaten fresh, or pickled. *June—Sep.*

2. C. Melo.

Musk Melon.

Stem prostrate, trailing, rough; tendrils simple; leaves roundish, somewhat cordate, palmately 5-angled or lobed; lobes rounded, obtuse, slightly denticulate; flowers sterile, fertile and perfect, yellow; fruit oval or subglobose. Cultivated for the sweet and juicy flesh of its ripe fruit. *June—July.*

3. C. Citrullus.

Water Melon.

Stem slender, prostrate, trailing, hairy; leaves palmately 5-lobed, very glaucous beneath; lobes mostly sinuate-pinnatifid, with obtuse segments; flowers yellow, solitary, bracted at base, on hairy peduncles; fruit smooth, elliptical or subglobose, marked with various shades of green, very juicy. Cultivated for its large fruit, filled with sweet, refreshing juice. *June—Aug.*

8. CUCURBITA.

Flowers monœcious. Corolla campanulate. Petals united and cohering with the calyx. STERILE FLOWERS—Calyx 5-toothed. Stamens 5, triadelphous, with united, straight anthers. FERTILE FLOWERS—Calyx 5-toothed, upper part deciduous after flowering. Stigmas 3, thick, 2-lobed. Pepo fleshy or woody, 3—5-celled. Seeds obovate, compressed, smooth, with thickened margins. *An.*

1. C. Pepo.

Pumpkin.

Plant rough and hispid; stem procumbent; tendrils branched; leaves very large, cordate, palmately 5-lobed or angled, denticulate; flowers large, axillary, yellow; sterile ones on long peduncles; fruit very large, roundish, umbilicate, smooth, furrowed, torulose and yellow, when ripe. Common in cultivation, especially for cattle, and also for culinary purposes. *July.*

2. C. Melopépo.

Flat Squash.

Hairy; stem procumbent; tendrils branched; leaves cordate, somewhat palmately 5-lobed, denticulate; flowers yellow; fruit depressed, orbicular, with torulose or tumid margins, smooth or warty. A well-known kitchen vegetable, cultivated for its fruit, which varies much in shape and in color, from yellow to cream-color or white.

3. C. verrucosa.

Crook-neck Squash.

Hairy; stem procumbent; leaves cordate, deeply and palmately 5-lobed, denticulate, the middle lobe narrowed at base; flowers yellow, pedunculate, large; fruit clavate, often elongated and curved inward at base. A kitchen vegetable, equally common with the last. *July.*

4. C. ovifera.

Egg Squash.

Hairy; stem procumbent; leaves cordate, palmately 5-lobed, denticulate, hairy; calyx obovate; fruit obovate, striped with longitudinal lines. A common kitchen vegetable. *July.*

ORDER LIV. Crassulaceæ.—Stone-crop-family.

1. SEDUM.

Sepals 4—5, more or less united at base. Petals 4—5, distinct. Stamens 8—10. Carpels 4—5, distinct, many seeded, with an entire scale at the base of each. *Per.*

1. S. ternatum.

Stone-crop.

Leaves smooth, entire, lower ones ternately verticillate, obovate, tapering at base, uppermost ones scattered, lanceolate, sessile; cyme consisting of about 3 spikes; flowers several and octandrous, except the central one, which is decandrous, all white, sessile, as long as the leafy bracts. A low plant, with stems creeping at base, assurgent above, 3'—8' long. Native in Canada-West, Penn., and the Western States. Common in cultivation in N. Eng. *July—Aug.*

2. S. Telèphium.

Orpine, Live-forever.

Root tuberous, fleshy, white; stem simple, erect, round, leafy; leaves flatish, ovate, serrate, obtuse, scattered, sessile; cymes corymbose, leafy. Flowers white and purple. Common in gardens, and somewhat naturalized. Stems of a purplish color, about 1 foot high, growing in tufts. *Aug.*

3. S. acre.

Wall-pepper.

Stems procumbent, branching at base; leaves minute, somewhat ovate, fleshy, obtuse, alternate, crowded, sessile and nearly erect; cymes few-flowered in 3 divisions, leafy; flowers yellow. A little fleshy plant, rapidly spreading wherever it is planted, and thickly covering the surface. *June—July.*

2. SEMPERVIVUM.

Sepals 6—20, slightly united at base. Petals 6—20, acuminate. Stamens twice as many as the petals. Ovaries with lacerated scales at base. Carpels 6—20. *Per.*

1. S. Tectòrum.

House-leek.

Herbaceous; leaves thick and fleshy, fringed; offsets spreading. A common plant in gardens, which sends out runners with offsets, and thus propagates itself, flowering only occasionally. Like many plants of this order, it is so hardy that it will grow any where, even on dry walls.

3. PENTHÖRUM.

Sepals 5, united at base. Petals 5, or none. Stamens 10. Capsules of 5 united carpels, 5-angled, 6-celled, and 5-beaked. *Per.*

1. P. sedoides.

Virginia Stone-crop.

Stem erect, somewhat branched, angular above; leaves lanceolate, smooth, acute at both ends, serrate, almost sessile; flowers yellowish-green, inodorous, in recurved, many-flowered racemes, arranged in a cyme; petals generally none. A very common plant of no beauty, growing 8'—15' high, in moist ground. *Aug.—Sep.*

ORDER LV. Saxifragaceæ.—Saxifrage-family.

SYNOPSIS OF THE GENERA.

SUBORDER I. Saxifrageæ.

- Petals imbricate in prefloration. Herbs with alternate, or opposite leaves.
1. SAXIFRAGA. Petals entire. Stamens 10. Capsule 2-celled. Flowers in cymes.
3. TIARÉLLA. Petals entire. Stamens 10. Capsule 1-celled. Flowers in racemes.
2. MITÉLLA. Petals pectinately divided. Stamens 10. Capsule 1-celled.
4. CRYSOPLÉNUM. Petals none. Stamens 8—10. Aquatic.

SUBORDER II. Hydrangeæ.

- Petals valvate in prefloration. Shrubs with opposite leaves.
5. HYDRANGEA. Flowers in cymes; marginal ones usually larger and sterile; the others perfect.

SUBORDER III. Philadelphææ.

- Petals convolute in prefloration. Shrubs with opposite leaves.
6. PHILADELPHUS. Flowers in racemose, few-flowered clusters. Stamens 20—40.

1. SAXIFRAGA.

Sepals 5, more or less united, often coherent with the base of the ovary. Petals 5, inserted on the calyx-tube, entire. Stamens 10. Anthers 2-celled, opening longitudinally. Capsule of 2, more or less united carpels, 2-celled below, opening between the 2 divergent beaks. Seeds numerous. *Per.*

1. S. Virginiensis.

Early Saxifrage.

Leaves mostly radical, ovate, or spatulate-obovate, crenately toothed, on broad petioles; scape mostly naked, paniculately branched above. Flowers small, white, numerous, cymose; calyx adherent to the base of the ovary;

petals twice as long as the calyx. A very early flowering plant, common on rocks and dry hills, with a pubescent scape 8'—10' high. *April—May.*

2. *S. Pennsylvanica.**Tall Saxifrage.*

Leaves radical, oval or oblong-lanceolate, rather acute, tapering at base, with short, margined petioles; scape almost leafless, striate, viscid-pubescent, with alternate branches and dense cymes, forming an oblong panicle; flowers yellowish-green, pedicellate; petals linear-lanceolate, scarcely longer than the calyx. A common but by no means beautiful plant in swamps and meadows, with hollow scapes 1—3 ft. high, supporting a large panicle of small, greenish flowers. *May.*

2. MITÉLLA.

Calyx campanulate, 5-cleft, valvate in prefloration. Petals 5, pinnatifid, inserted into the throat of the calyx. Stamens 5—10, included. Styles 2, short, distinct. Capsule 1-celled, 2-valved. *Per.*

1. *M. diphylla.**Common Mitella.*

Stem simple, pubescent; leaves cordate, serrately toothed, somewhat lobed, pubescent; radical ones on long, hairy petioles; cauline ones, 2, opposite, nearly sessile; flowers white, in long, terminal racemes on short pedicels, beautifully marked by the pectinate petals; styles short. A very elegant plant 6'—12' high. Most common in the more northern states. *May—June.*

2. *M. nuda.**Dwarf Mitella.*

Stem prostrate, or erect, slender, stoloniferous; leaves orbicular-cordate, or somewhat reniform, doubly crenate, with a few scattered hairs above; scape filiform, few-flowered, naked or with a single leaf; flowers white; petals finely pinnatifid, with filiform segments. A very delicate and elegant species, growing in deep moist woods, with light green, handsome leaves, and very delicately beautiful flowers. Not uncommon in N. New England and New York. *June.*

3. TIARÉLLA.

Calyx 5-parted, with obtuse lobes, valvate in prefloration. Petals 5, entire. Stamens 10, inserted with the petals into the calyx. Styles 2. Capsule 1-celled, 2-valved; valves very unequal. *Per.*

1. *T. cordifolia.**Mitre-wort.*

Acaulescent; leaves cordate, acutely 3—5-lobed, dentate, with mucronate teeth, hirsute above, pubescent beneath, with scattered hairs; stolons creeping; flowers white, in racemes terminating the pubescent scapes, which are 4'—10' high, and sometimes bear a leaf; bracts minute; petals oblong. A plant much resembling *Mitella diphylla*, with which it commonly grows in rocky woods. *May—June.*

4. CHRYSOPLÉNium.

Calyx coherent with the ovary, 4—5-lobed, colored within. Petals none. Stamens 8—10, with short filaments, and reniform anthers. Styles 2. Capsule obcordate, compressed, 1-celled, 2-valved. Seeds numerous. *Per.*

1. *C. Americánum.**Water-carpet.*

Stem slender, square, decumbent, dichotomously branched above; leaves opposite; upper ones often alternate; all roundish-ovate, somewhat crenate, attenuate to a petiole at base, smooth; flowers remote, sessile; calyx usually 4-cleft, greenish yellow, marked with purple lines; stamens 8, very short, with orange-colored anthers. A little aquatic plant in shady springs and streams, distinguished by its conspicuous anthers. *March—May.*

5. HYDRÁNGEA.

Flowers either all fertile, or more commonly the marginal ones are sterile. STERILE FLOWERS.—Calyx colored, membranaceous, veiny, 4—5-cleft. Petals, stamens, and styles none. FERTILE FLOWERS.—Calyx-tube hemispherical, coherent with the ovary, with a 4—5-toothed, persistent limb. Petals ovate, sessile. Stamens twice as many as the petals. Styles 2, distinct. Capsule 2-beaked, opening by a foramen between the beaks. Seeds numerous.

1. *H. arborescens.**Common Hydrangea.*

Leaves ovate, or cordate, mostly acuminate, serrately toothed, nearly smooth; flowers white, in fastigate cymes, either all fertile, or especially in cultivation, the marginal ones radiate, or all radiate. A native of Penn., cultivated at the North. *June.*

2. *H. quercifolia.**Oak-leaved Hydrangea.*

Leaves deeply and sinuately 3—5-lobed, dentate, tomentose beneath; flowers in paniculate, radiant cymes; the sterile ones very large and numerous with roundish sepals, dull white, changing to reddish. A very showy shrub, with extremely large leaves, native of Florida, not uncommon in cultivation. *June.*

3. *H. hortensis.**Changeable Hydrangea.*

Leaves elliptical, narrowed at each end, serrated or toothed, strongly veined; smooth; cymes radiant; flowers mostly sterile. A species, 1—2 ft. high, very common in house cultivation. The barren flowers are numerous and changeable, passing through several gradations of color, from green to straw-color, yellow, white, purple, and pink, and continuing very showy for some months.

6. PHILADÉLPHUS.

Calyx 4—5-parted, persistent, with the tube half adherent to the ovary. Petals 4—5, convolute in prefloration. Stamens 20—40, shorter than the petals. Capsule 4-celled, 4-valved, with loculicidal dehiscence. Seeds many, with an aril.

1. *P. grandiflorus.**Large-flowered Syringa.*

Somewhat pubescent; leaves ovate, acuminate, sharply denticulate and veined; flowers large, white, on slender pedicels, in clusters of 1—3, at the ends of the branches, nearly scentless; calyx-segments conspicuously acuminate, much longer than the tube. An ornamental Southern shrub, often cultivated. Stems 6—8 ft. high, with long, slender branches. *June.*

2. *P. coronarius.**False Syringa.*

Leaves ovate, somewhat dentate, smooth, petiolate; flowers numerous, white, very fragrant, in leafy clusters at the ends of the branches. A beautiful shrub, 5—7 ft. high, with opposite, reddish branches, and handsome, fragrant flowers, often cultivated. *June.*

ORDER LVI. Hamamelaceæ.—Witch-Hazel tribe.

1. HAMAMÉLIS.

Calyx 4-parted, 2—3-bracted at base. Petals 4, very long, linear, marcescent. Fertile stamens 4. Sterile ones 4, scale-like, opposite the petals. Capsule 2-celled, with loculicidal dehiscence.

1. *H. Virginiana.**Witch Hazel.*

Leaves obovate or oval, crenately toothed, obliquely subcordate at base, on short petioles, nearly smooth; flowers sessile, 3—4 together, axillary; petals narrowly linear, curled or twisted, yellow; calyx downy; ovary hirsute. A large shrub of irregular growth, sending off large branches at or near the ground, in an oblique direction, and growing 10—15 ft. high. While all the shrubs and trees, itself included, are putting off their summer garb of green, this shrub begins to send forth abundantly, in the midst of sear and falling leaves, its golden-yellow blossoms, cheering the desolate woods in favorable locations, and seasons, often until into December.

ORDER LVII. Umbelliferae.—The Umbellate-family.

SYNOPSIS OF THE GENERA.

A. Flowers in simple umbels.

1. HYDROCÓTYLE. Flowers greenish. Fruit compressed, orbicular. Leaves roundish.

B. Flowers in compound umbels.

* Petals greenish.

2. SANICULA. Flowers polygamous. Fruit subglobose, hispid with hooked prickles. Leaves palmately parted.

11. ARCHANGÉLICA. Fruit dorsally compressed, with 2-winged margins, not prickly.

** Flowers white.

3. DISCOPLEURA. Calyx-teeth subulate. Fruit compressed laterally, wingless, ovate. Leaves very finely dissected.

4. CICUTA. Calyx-teeth broad. Fruit roundish, compressed laterally, wingless. Leaves bi- or tri-ternate.

5. SLIM. Calyx-teeth minute, or wanting. Fruit laterally compressed, wingless. Leaves pinnate.

6. *CRYPTOTENIA*. Partial umbels with unequal rays. Fruit nearly oblong, laterally compressed, wingless. Leaves 8-foliate.

8. *CARUM*. Fruit oval, laterally compressed, wingless. Leaves somewhat bi-pinnatifid.

9. *APIUM*. Calyx-teeth obsolete. Fruit roundish, laterally compressed, wingless. Lower leaves pinnately parted.

13. *HERACLEUM*. Fruit dorsally compressed, flat, with a broadly winged margin. Leaves ternately parted.

14. *DABCUS*. Fruit oblong, not compressed, clothed with prickles in separate rows.

15. *OSMORHIZA*. Fruit linear, clavate, tapering at base, with bristly ribs.

16. *CÖNIUM*. Calyx-teeth obsolete. Fruit ovate, laterally compressed, with 5 undulate ribs. Leaves bi- or tri-ternately decompound.

17. *CORIANDRUM*. Calyx with a distinct tube. Fruit globose. Leaves pinnately parted.

*** Flowers yellow.

7. *ZIZIA*. Fruit oval, laterally compressed. Leaves bi-ternately divided.

10. *FENICULUM*. Fruit oblong, laterally compressed, with obtuse ribs. Leaves bi-ternately dissected, with filiform segments.

12. *PASTINACA*. Fruit oval, dorsally compressed, very flat, with a thin, broadly winged margin. Leaves pinnately parted.

1. HYDROCÖTYLE.

Calyx obsolete. Petals ovate, entire, acute, spreading, with the point not inflexed. Fruit flattened laterally, with a narrow commissure. Carpels without vittæ. *Per.*

1. *H. Americana*.

Penny-wort.

Smooth and shining; stem flexuous, branching, often decumbent; leaves orbicular-renaliform, somewhat lobed, doubly crenate; flowers minute, greenish, in axillary, sessile, few-flowered, greenish, capitate umbels; fruit very minute, orbicular. A smooth and delicate plant, growing in wet, grassy places. Very common. Stems 2'—4' long. *June—Aug.*

2. SANICULA.

Flowers polygamous. Calyx-tube echinate. Petals obovate, erect, with a long inflexed point. Fruit subglobose, armed with hooked prickles. Carpels not ribbed, furnished with numerous vittæ. *Per.*

1. *S. Marilandica*.

Sanicle.

Leaves digitately 5—7-parted, mostly radical; segments oblong or cuneate, incelsely serrate; cauline leaves few, nearly sessile; flowers greenish, small, mostly barren; umbels with few rays, often proliferous; umbellets with numerous rays; involucre 6-leaved, serrate; sterile flowers numerous, on pedicels as long as the fertile, sessile flowers; style elongated, conspicuous and recurved. A common plant 2—3 feet high, dielichotomous at summit. In woods and thickets. *June—July.*

3. DISCOPLEÜRA.

Calyx-teeth subulate, persistent. Petals ovate, entire, with minute inflexed point. Fruit ovate, frequently didymous. Carpels with 3 prominent, filiform, dorsal ribs, and 2 lateral ones, united with a thick margin. Intervals with single vittæ. Seeds nearly round. *An.*

1. *D. capillacea*.

Bishop-weed.

Erect or procumbent; leaves very finely dissected, with setaceous segments; umbels with 8-10 rays; leaflets of the involucre 3—5, usually 3-parted; involucre filiform, longer than the umbellets; flowers white; fruit ovate. A very smooth plant, 1 foot high, in salt marshes. Mass., R. I., and southward. *July—Oct.*

4. CICUTA.

Calyx-margin with 5 broad teeth. Petals obovate, with an inflexed point. Fruit roundish, didymous. Carpels with 5, flat-tish, equal ribs, 2 of them marginal. Intervals filled with single vittæ. Commissure with 2 vittæ. Carpophore 2-parted. Seeds terete. Involucres few-leaved, or none. Involucels many-leaved.

1. *C. maculata*.

Water Hemlock.

Stem smooth, hollow, often streaked with purple; lower leaves tri-ternately divided; upper ones biternately divided; leaflets lanceolate, acuminate, serrate, smooth; flowers white, in axillary and terminal umbels; involucre-leaves none, or 1—2 small ones; involucre of 5—6 linear divisions; calyx and style persistent; root thick, fleshy, poisonous. A common plant in wet meadows, 4—8 feet high, with decompound leaves. The terminal leaflet is often pinnate or quinately. *July—Aug.*

2. *C. bulbifera*,

Bulbous Cicuta.

Stem round, hollow, striate, green; axils of the branches bearing small bulblets; leaves biternately divided; leaflets mostly linear, varying from almost

setaceous to linear-lanceolate; flowers small, white, in axillary and terminal umbels; involucels setaceous. A slender species 3—5 feet high, in swamps. Not so common as the last. *Aug.*

5. SIUM.

Calyx-margin 5-toothed or obsolete. Petals obovate, with an inflexed point. Fruit nearly oval. Carpels with 5 obtuse ribs. Vittæ usually several in each interval. Carpophore 2-parted. *Per.*

1. *S. lineare*.

Long-leaved Sium.

Stem angular, sulcate; leaves pinnate; leaflets linear or linear-lanceolate, finely serrate; flowers white, small; involucres with 5-6 linear divisions; calyx-teeth minute; fruit obovate. A tall and stout plant, 3—5 feet high, with narrow leaflets. Common, especially near the sea-coast. *July.*

6. CRYPTOTENIA.

Calyx-margin obsolete. Petals obovate, with an inflexed point. Fruit linear-oblong or ovate-oblong. Carpels with 5 equal, obtuse ribs. Vittæ very narrow, twice as many as the ribs. Carpophore free, 2-parted. *Per.*

1. *C. Canadensis*.

Hone-wort.

Stem smooth, branching above; leaves 3-parted, petiolate; segments ovate, entire, or 2—3-lobed, doubly serrate; teeth coarse, mucronate; umbels irregular, axillary and terminal, somewhat paniculate, with very unequal rays; flowers small, white; involucres none; involucels few-leaved; fruit oblong-elliptical. A common plant in moist woods, 1—2 feet high, with the radical leaves on long petioles, and distinguished by its irregular umbels and umbellets. *July.*

7. ZIZIA.

Calyx-margin obsolete, or with 5 very minute teeth. Petals oblong, with an inflexed point. Fruit oval, didymous. Carpels 5-ribbed, with the lateral ribs marginal. Intervals with 1—3 vittæ. Commissure with 3—4. Involucre none. Involucels few-leaved. *Per.*

1. *Z. aurea*.

Golden Alexander.

Smooth; stem erect, or somewhat decumbent, sulcate, branching above; leaves biternately divided; segments oblong-lanceolate, serrate; umbellets with short rays; flowers small, deep yellow; involucels of 2—3 very small leaflets; fruit elliptical, brown when mature. Not uncommon in woods and fields. Stem 6'—12' high. *May—June.*

8. CARUM.

Calyx-margin obsolete. Petals obovate, emarginate, with an inflexed point. Styles spreading, dilated at base. Fruit oval, compressed laterally. Carpels 5-ribbed, lateral ribs marginal. Intervals with single vittæ. Commissure with 2. *Per.*

1. *C. Cárvi*.

Caraway.

Leaves somewhat bi-pinnatifidly divided; segments numerous, linear; involucre 1-leaved, or none; involucels none; flowers white. A common plant in gardens, cultivated for its aromatic fruit. Stem 2—3 feet high, smooth and branching. Lower leaves large, on long petioles, with large, swelling sheaths. *June.*

9. APIUM.

Calyx-margin obsolete. Petals roundish, with an inflexed point. Fruit roundish, laterally compressed. Carpels 5-ribbed; the lateral ribs marginal. Intervals with single vittæ. Carpophore undivided. *Biennial.*

1. *A. graveolens*.

Celery.

Stem branching, furrowed; lower leaves pinnately dissected, on very long petioles; segments broadly cuneate, incised; upper leaves 3-parted; segments cuneate, lobed and incelsely dentate at apex; flowers white, in umbels, with unequal, spreading rays. Cultivated in gardens for its stem and radical petioles, which when blanched are eaten as salad. *July—Aug.*

10. FENICULUM.

Calyx-margin obsolete. Petals revolute, with a broad, retuse apex. Fruit oblong, somewhat laterally compressed. Carpels with 5 obtuse ribs; marginal ones a little broader. Intervals with single vittæ; commissure with 2. *An.*

1. *F. vulgare*.

Fennel.

Stem round, smooth, branched; leaves biternately dissected, with linear-subulate, elongated segments; umbels with numerous unequal spreading rays,

involucre and involuclcs none; carpels turgid, oblong-ovate; flowers yellow. Common in gardens; cultivated for its aromatic seeds. *July*.

11. ARCHANGÉLICA.

Calyx-teeth short. Petals equal, entire, acuminate, with the point inflexed. Fruit dorsally compressed. Carpels with 3 carinate dorsal ribs, with the 2 lateral ones dilated into wings. Vitæ very numerous. *Per*.

1. *A. atropurpurea*.*Angelica*.

Stem mostly dark purple, furrowed; leaves 3-parted, on large, inflated petioles; divisions of the leaves bipinnately divided, with 5-7 segments; the 3 terminal ones confluent, sub-acuminate, unequally serrate; flowers greenish, in very large umbels, on nearly smooth peduncles; involucre almost none; involuclcs many-leaved; fruit smooth. A tall, rank plant in meadows, with very large greenish umbels, and aromatic seeds. Stem 4-6 feet high, hollow. *June*.

12. PASTINÀCA.

Calyx-teeth obsolete, or minute. Petals roundish, entire, involute, with an inflexed point. Fruit much compressed, with a broad, flat margin. Carpels with 5, nearly obsolete ribs. Intervals with single vitæ; commissure with 2 or none. Carpophore 2-parted. Seeds flat. Involucre and involuclcs few-leaved; or none. *Per*.

1. *P. sativa*.*Parsnip*.

Roots fleshy; stem smooth, sulcate; leaves pinnately divided, slightly pubescent, especially beneath; leaflets ovate, or oblong, unequally serrate; terminal one often 3-lobed; umbels large, on long peduncles; flowers yellow; fruit oval; commissure with 2 vitæ, which are dark purple. Common in cultivation, and also naturalized in waste places. Stem 3-5 ft. high. *July—Sep. Biennial*.

13. HERACLÉUM.

Calyx with 5, small, distinct teeth. Petals obovate, with an inflexed point, in the exterior flowers often radiate and apparently deeply 2-cleft. Fruit compressed, flat, with broad, flat margins. Carpels with 3 obtuse, dorsal ribs. Intervals with single, mostly clavate vitæ. Seeds flat. Involucre caducous, mostly few-leaved. Involuclcs many-leaved. *Per*.

1. *H. lanatum*.

Stem sulcate, branching, hollow, pubescent; leaves very large and broad, especially the lower ones, on very large petioles, ternately divided, tomentose beneath; leaflets petiolate, roundish-cordate, unequally lobed; lobes acuminate, nearly smooth above; flowers white, in very large umbels; segments of the involucre lanceolate, deciduous, those of the involuclcs lanceolate, acuminate; fruit nearly orbicular. A tall, rank plant, 4-8 ft. high, in meadows, distinguished by its large leaves, and its immense umbels (often a foot in diameter), of which the marginal flowers are generally radiate and much larger than the others. *June*.

14. DAÛCUS.

Calyx-margin 5-toothed. Petals obovate, emarginate with an inflexed point, the 2 outer often the largest, and deeply 2-cleft. Fruit ovoid, or oblong. Carpels with 5 primary ribs, 3 dorsal and 2 on the flat commissure, and 4 secondary ribs, the latter more prominent, winged, and each bearing a single row of prickles, with single vitæ beneath. Carpophore entirely free. *Bienn*.

1. *D. Carota*.*Carrot*.

Stem hispid, branching; leaves bi- or tri-pinnatifid; segments pinnatifid; leaflets lanceolate or linear; leaflets of the involucre pinnatifid, nearly as long as the umbel; leaflets of the involuclcs entire, or 3-cleft; flowers white, sometimes yellowish; the central flower in each umbellet abortive, rose-colored. Root conical. Common in cultivation. Naturalized along roadsides and in dry fields. Common. *July*.

15. OSMORHIZA.

Calyx-margin obsolete. Petals oblong, entire; the cuspidate point inflexed. Styles conical at base. Fruit very long, linear, clavate, attenuate at base. Carpels with 5 acute, bristly ribs. Intervals without vitæ. Commissure with a deep bristly channel. *Per*.

1. *O. longistylis*.*Sweet Cicely*.

Stem branching above, nearly smooth; leaves biternately divided; radical and lower cauline ones on long petioles; segments broadly ovate, somewhat lobed, slightly pubescent on both sides; flowers white; umbels of about 5 rays; involucre of 1-3 linear, ciliate leaflets, longer than the rays; involuclcs of 5 lanceolate leaflets; styles filiform, nearly as long as the ovary; fruit clavate, dark green or blackish, hispid, crowned with the slender, and at length divergent styles. Root fasciculate and rather fleshy, of a sweet anise-like flavor. A common plant in woods, 1-3 ft. high, of a very agreeable, spicy odor and taste, especially the root. *May—June*.

2. *O. brevistylis*.*Hairy Cicely*.

Stem erect, branching, mostly pubescent; leaves biternately divided; segments pinnatifid, hairy on both sides; flowers white, smaller than in the last; styles conical, scarcely as long as the ovary is broad; fruit somewhat tapering, with the persistent styles at length converging. The root has a sweetish, rather disagreeable taste, and is entirely destitute of the anise-like flavor of the last. The plant is more hairy, and the segments of the leaves more deeply cleft. Stem 1-3 ft. high. Grows in woods, rather common. *May—June*.

16. CÔNIMUM.

Calyx-margin obsolete. Petals obovate, with a short inflexed point. Fruit ovate, with compressed sides. Carpels with 5 prominent, equal, undulate-crenulate ribs; the lateral ones marginal. Intervals without vitæ. Seeds with a deep narrow groove in the face. *Bienn*.

1. *C. maculatum*.*Poison Hemlock*.

Stem smooth, branching, hollow, spotted; leaves decomposed, bipinnately divided; leaflets lanceolate, pinnatifid, with acute lobes; involucre of about 5 lanceolate leaflets; involuclcs of 3-5 unilateral leaflets; flowers small, white, in terminal umbels; fruit smooth. A common poisonous weed, 3-8 ft. high in waste places. Introduced. The lower leaves are very large, on long petioles. The whole plant is a powerful narcotic poison, and has a disagreeable odor, especially when bruised. *July—Aug*.

17. CORIÁNDRUM.

Calyx with 5 conspicuous teeth. Petals obovate, inflexed at the point; outer ones much larger, bifid. Fruit globose. Carpels cohering together, with 5 depressed, primary ribs, and 4 secondary, more prominent ones. Seeds concave on the face. *An*.

1. *C. sativum*.*Coriander*.

Glabrous; leaves bipinnately divided; lower ones with broad, cuneate segments; upper ones with linear segments; involucre none; involuclcs 3-leaved, unilateral; flowers white; carpels hemispherical. A well known garden plant, 2-3 ft. high, with strong-scented leaves. Cultivated for its aromatic fruit. *July*.

ORDER LVIII. Araliaceæ.—Spikenard-family.

1. ARALIA.

Calyx-limb 5-toothed or entire, short. Petals 5, spreading. Stamens 5, alternating with the petals. Styles 5, at length diverging. Fruit baccate, 5-lobed, 5-celled, 5-seeded. *Per*.

1. *A. racemosa*.*Petty-morrel*.

Stem smooth, herbaceous, branching; leaves decomposed, 3-5-parted; each division with 3-5 ovate, cordate, serrate, acuminate leaflets; umbels small, numerous, arranged in branching, compound racemes, forming panicles on axillary peduncles; flowers small, greenish-white; fruit small, dark-purple. A well known plant in rich, rocky woodlands, 3-6 feet high, with a thick, pleasantly aromatic root. The leaves are very large, light-green. *July*.

2. *A. nudicaulis*.*Sarsaparilla*.

Nearly aculeate; leaf radical, solitary, on a long, 3-cleft petiole; each division pinnately 3-5 foliate; leaflets oval or obovate, sharply serrate, acuminate; scape naked, shorter than the leaf, bearing 3 simple, pedunculate umbels; flowers small, greenish; root long, creeping, aromatic. A common well known plant in rich woods, with a scape about 1 foot high. *May—June*.

2. PÂNAX.

Flowers polygamous. Calyx-limb very short, obscurely 5-toothed. Petals 5, spreading. Stamens 5, alternate with the petals. Styles 2—3. Fruit drupaceous, fleshy, 2—3-celled. Cells 1-seeded. *Per.*

1. *P. trifolium*.*Dwarf Ginseng.*

Root globose; leaves 3, verticillate, 3—5-foliate; leaflets oblong-lanceolate, serrate, sub-sessile; peduncle nearly as long as the leaves; flowers white, on short pedicels; styles 3; berries 3-seeded. A delicate little plant, common in low woods, 3—6' high, with a simple, slender stem, a whorl of three leaves at top and a little umbel of white flowers, on a long peduncle, rising from the centre. *May.*

2. *P. quinquefolium*.*Ginseng.*

Root fusiform; stem simple, smooth; leaves 3, verticillate, 5-foliate; leaflets obovate-oblong, acuminate; the lateral ones smaller; peduncle almost as long as the petioles; flowers yellowish, on short pedicels; styles 2; ovary 2-celled; stem about 1 foot high, bearing a simple umbel, succeeded by bright scarlet berries. A much larger plant in all its parts than the last, and less common, being met with most frequently in rich woods, in mountainous districts. *July.*

3. HÉDERA.

Calyx 5-toothed. Petals 5, dilated at base. Berry 5-seeded, surrounded by the persistent calyx. *Evergreen.*

1. *H. helix*.*English Ivy.*

Stem and branches long and flexible, attaching themselves to the earth, walls, or trees, by numerous rootlets; leaves dark-green, smooth, petiolate, with white veins; lower ones 5-lobed; upper ovate; flowers green, in numerous umbels, arranged in corymbs; berry black. A climbing, shrubby plant, becoming common in cultivation, especially for training on walls.

ORDER LIX. Cornaceæ.—*Cornel-family.*

1. CÔRNUS.

Calyx-limb 4-toothed, with minute segments. Petals 4, oblong, spreading. Stamens 4, with filiform filaments. Style 1. Drupes baccate. *Trees, shrubs, and perennial herbs.*

1. *C. alternifolia*.*Common Cornel.*

Leaves more or less alternate, oval, acuminate, smooth above, hoary-pubescent beneath; cymes loose, spreading; flowers yellowish-white; drupes light blue. A small tree in moist woods, with alternate greenish warty branches. The leaves are irregularly arranged on the branches, but are for the most part alternate. *June.*

2. *C. circinata*.*Round-leaved Cornel.*

Branches greenish, spotted, warty; leaves very broad, oval, or orbicular, abruptly acuminate, white-tomentose beneath; cymes rather small, depressed; flowers white; petals ovate; berries light blue. A shrub of irregular, straggling growth, about 8 feet high. Woods and banks of streams. Not uncommon. *June.*

3. *C. sericea*.*Red Osier.*

Branches spreading, dark purple; branchlets red; cymes and petioles woolly; leaves opposite, entire, oval or ovate, woolly beneath, mostly ferruginous, especially on the veins, acuminate; cymes depressed, crowded; flowers yellowish-white; drupes sub-globose, bright blue. A large shrub, 6—10 feet high, with rather variable and stout shoots, which are dark red, especially in winter. Along streams and in wet grounds. Common. *June.*

4. *C. stolonifera*.*White-berried Cornel.*

Stems often reclined and stoloniferous; shoots virgate, bright reddish-purple; branches smooth, spreading; leaves ovate, acute, hoary-pubescent beneath; cymes flat, nearly smooth; petals ovate; drupes white, lead-color when fully ripe. A small tree, 8—10 feet high, with dark red, smooth shoots, especially conspicuous in winter, often sending out branches, which take root and send up erect shoots. Most common in the more northern portions of N. England and N. York. *June.*

5. *C. florida*.*Box-wood.*

Leaves ovate, acuminate, acute at base, entire; flowers small, greenish-

yellow, surrounded by a large 4-leaved involucre, the segments of which are obovate, with a callous point at apex, apparently emarginate, white and showy, often tinged with red; drupes oval, bright red. A tree 15—30 feet high, common in woods, and making a great display when in blossom. The wood is exceedingly hard and compact. The bark is bitter, with tonic properties. *May—June.*

6. *C. Canadensis*.*Low Cornel.*

Herbaceous; flowering stems low, simple, erect; rhizoma creeping, somewhat woody; upper leaves about 6, somewhat verticillate, on short petioles, oval, acute, or acuminate; involucre 4-leaved, much larger than the flowers; leaflets broad-ovate, greenish-white, petaloid, inclosing the umbel of greenish-yellow flowers; drupes red, baccate, rather large, and of a sweetish taste. An elegant little plant in damp woods and shady swamps, 4—6' high. The flowering stems look as if they had one large white flower, and are accompanied by numerous barren ones, with 4 leaves at top. *Per. May—June.*

ORDER LX. Caprifoliaceæ.—*Honeysuckle-family.*

SYNOPSIS OF THE GENERA.

* *Corolla more or less tubular.*

1. LONICERA. Calyx-teeth very short. Corolla funnel-form, or tubular; limb with 5, irregular, or nearly regular segments. Stamens 5, exsert. Fruit a berry. Leaves not serrate.

2. DIERVILLA. Calyx with 5, subulate, persistent teeth; Corolla funnel-form. Limb with 5 nearly equal segments. Stamens 5. Shrubs with serrate leaves.

3. TRIOSTEUM. Calyx with 5 linear, leafy, persistent teeth. Corolla tubular, gibbous at base, with 5 nearly equal segments. Herbs.

4. SYMPHORICARPUS. Calyx with 4—6 persistent teeth. Corolla campanulate, regularly 4—5-lobed. Stamens 4—5, included. Fruit a berry. Shrubs.

5. LINNÆA. Calyx with 5 deciduous, subulate teeth. Corolla campanulate, with 5, nearly equal lobes. Stamens 4, 2 longer than the other 2. Trailing evergreens.

** *Corolla rotate, deeply and regularly 5-lobed.*

6. SAMBUCUS. Calyx-teeth minute or wanting. Fruit a pulpy berry. Shrubs with pinnate leaves.

7. VIBURNUM. Calyx distinctly 5-toothed. Fruit a dry drupe. Shrubs with simple leaves.

1. LONICERA.

Calyx-limb with 5 short teeth. Corolla tubular or funnel-form, gibbous at base, with a 5-cleft, usually quite irregular limb. Stamens 5, exsert. Ovary 2—3-celled. Berry few-seeded.

* *Climbing shrubs. Flowers in whorls.*

1. *L. parviflora*. *Small-flowered Honeysuckle.*

Leaves smooth, oblong, or elliptical, dark green and shining above, glaucous beneath; the upper pairs connate, all sessile, undulate, and revolute at the margin; flowers in 2—3 approximate, pedunculate whorls; corolla irregular, gibbous at base, with a short tube, pale yellow, and generally tinged with dull red; filaments bearded; berries orange-colored. A slender shrub, frequently climbing, sometimes nearly or quite erect; growing in rocky woods. Not uncommon. *May—June.*

2. *L. sempervirens*. *Trumpet Honeysuckle.*

Leaves oblong, evergreen, pale beneath, upper pairs connate; flowers in somewhat distant whorls, almost regular, ventricose above, scarlet without and yellow within, nearly 2' long, inodorous. A splendid climbing evergreen species, native in N. York, especially near the city and southward. Common in cultivation. At the North the leaves are deciduous. *May—Aug.*

3. *L. Periclymenum*. *Woodbine Honeysuckle.*

Leaves distinct, elliptical, on short petioles; flowers in ovate, imbricate, terminal whorls; corolla ringent, yellow and red, fragrant; berries red. A very common species, much admired in cultivation. *May—July.*

A variety has smooth, lobed leaves.

4. *L. caprifolium*.*Italian Honeysuckle.*

Leaves deciduous, the upper pair connate; flowers in a terminal whorl; corolla ringent, varying through red, yellow, and white, very fragrant. A very beautiful cultivated species. *June—Aug.*

** *Shrubs. Flowers pedunculate.*

5. *L. ciliata*,*Fly Honeysuckle.*

Leaves ovate, or oblong-ovate, often cordate at base, ciliate, thin, villous beneath, when young; flowers in pairs, pendulous, axillary, connected by their

ovaries; corolla yellow at base, with short and nearly equal lobes, yellowish-white, spurred outwards; style exsert; berries ovoid, red, in pairs, distinct. An erect, elegant shrub, with delicate foliage and flowers. Not uncommon in woods; 2–4 feet high. *May–June*.

2. DIERVILLA.

Calyx-tube oblong, tapering at top; limb with 5 subulate, persistent teeth. Corolla funnel-shaped, 5-cleft and nearly regular. Stamens 5. Capsule 2-celled, 2-valved, many-seeded.

1. *D. trifida*.*Bush Honeysuckle.*

Leaves ovate, serrate, acuminate, smooth, on short petioles; peduncles axillary and terminal, 1–3-flowered; flowers greenish-yellow; ovaries slender, half as long as the corolla. A low, branching shrub, in woods and on hill-sides, with yellowish flowers, about $\frac{1}{4}$ long. *June*.

3. TRIÓSTEUM.

Calyx-limb with 5 linear, foliaceous, persistent teeth, equalling the corolla. Corolla tubular, gibbous at base; limb with 5 subequal lobes. Stamens included. Stigma capitate. Fruit dry, drupaceous, crowned with the calyx, 3-celled, 3-seeded. Seeds 3-angled, bony. *Per*.

1. *T. perfoliatum*.*Feverwort.*

Herbaceous; stem hollow, pubescent, simple; leaves ovate, acuminate, entire, tapering at base, connate, pubescent; flowers sessile, in verticils of 5–8; corolla viscid-pubescent, dull purple, with a curved tube; fruit somewhat 3-sided, orange-color when ripe. A coarse, hairy plant, 2–3 feet high, with inelegant flowers, growing in rich soil in woods and fields. *June*.

4. SYMPHORICÁRPUS.

Calyx-tube globose; limb with 4–5 persistent teeth. Corolla bell-shaped, quite regularly 4–5-lobed. Stamens 4–5, inserted on the corolla. Berry globose, 4-celled, 2-seeded; 2 cells abortive.

1. *S. racemósus*.*Snow-berry.*

Leaves oval, often undulate at the margin, mostly smooth, paler beneath, on short petioles; flowers in terminal, loose, interrupted and somewhat leafy racemes; corolla densely bearded within, rose-color; stamens and style included; berries large, roundish. An ornamental shrub, especially when covered with its brilliantly white berries. Native in W. Vermont and Canada. Common in cultivation. *June–Sep*.

5. LINNÆA.

Calyx-limb deciduous, with 5 subulate teeth. Corolla campanulate; limb with 5 nearly equal lobes. Stamens 4, 2 longer than the other 2. Berry 3-celled, dry, indehiscent, 1-seeded, with 2 abortive cells.

1. *L. boreális*.*Twin-flower.*

Evergreen; stems filiform, creeping, branching and rooting through their whole length; leaves small, roundish, crenate, with short petioles and a few scattered hairs; peduncles erect, filiform, slightly pubescent, furnished with leaves at base, and with 2 linear, minute bracts, dividing into 2 short pedicels, which support each a nodding, fragrant flower. Corolla rose-color, of a deeper hue inside. This very delicate and interesting little plant is found in moist woods, especially among evergreens, and is met with throughout most of N. Eng. and N. York; but is most abundant in the Northern portions. *June*.

6. SAMBÚCUS.

Calyx with 5, minute, or obsolete teeth. Corolla with 5 spreading segments. Stamens 5. Stigmas 3. Berry globose, pulpy, 3-seeded.

1. *S. Canadensis*.*Elder.*

Stem shrubby; leaves pinnate; leaflets 5–11, oblong or oval, serrate, acuminate, smooth, the lower ones sometimes 3-parted; cyme flat, 5-parted; flowers white, very numerous, with a rather oppressive odor; berry dark purple, juicy. A common shrub, 6–10 feet high, in waste grounds and along fences and thickets. Its large branches and stems are filled with pith, especially when young. *May–July*.

2. *S. pubens*.*Red-berried Elder.*

Stem shrubby, with a warted bark; leaves pinnate; leaflets 5–7, oval-lanceolate, acuminate, and with the petiole pubescent beneath; cymes densely

panicled, or pyramidal; flowers white; fruit scarlet, small. Common in the interior of New England and New York, but not near the sea coast. *May–June*.

7. VIBURNUM.

Calyx persistent, 5-toothed. Corolla with 5 obtuse, spreading segments. Stamens 5. Stigmas 3. Fruit a 1-celled, 1-seeded drupe.

1. *V. lantanoides*.*Hobble-bush.*

Leaves roundish, cordate at base, abruptly acuminate, closely serrate, with prominent veins; the veins and veinlets beneath, together with the petioles and branchlets, covered with ferruginous down; cymes sessile, broad and flat, flowers white, showy; fruit ovate, large, crimson, turning dark. A shrub of irregular, straggling growth; very handsome in flower, not uncommon in rocky woods of New England and New York. Its beauty consists in the large sterile flowers on the margins of the cymes. The fertile flowers are inconspicuous. *May*.

2. *V. ópulus*.*High Cranberry.*

Leaves chiefly 3-lobed, rounded, rarely tapering at base; lobes acuminate, dentate, with 2 glands on the petiole at the base of the leaf; cymes pedunculate; fruit ovoid, red, acid. A handsome shrub of erect growth and showy cymes, bordered as in the last, with large pure-white, sterile flowers. Most common in the northern parts of New York and New England.

Var. *roseum*.*Snow-ball.*

Leaves broader, rather acute at base; flowers all sterile, in globose cymes of snowy white. This is the Gutter Rose, a European variety, much cultivated in gardens.

3. *V. acerifolium*. *Maple-leaved Viburnum.*

Leaves 3-veined, 3-lobed, somewhat cordate at base, sharply serrate, with acuminate lobes, pubescent beneath; petioles and young branches pubescent; cymes on long peduncles, flat; stamens exsert; fruit oval, compressed; flowers dull white. A shrub 4–6 ft. high, with foliage resembling maple leaves. Common in woods. *June*.

4. *V. Lentágo*.*Sweet Viburnum.*

Leaves ovate, acuminate, finely and sharply serrate; petioles long, undulately margined; flowers white, in broad cymes; berries oval, finally black and edible, with a sweetish taste. A handsome shrub or small tree, 10–15 ft. high in woods and thickets. Common. *May–June*.

5. *V. nudum*.*White-rod.*

Smooth; leaves oval, or oblong, sometimes nearly lanceolate, dotted beneath, as well as the petioles and cymes, with brownish spots, revolute on the margin, coriaceous, nearly entire, or somewhat crenate; cymes smooth, on short peduncles; flowers white, numerous; fruit dark blue, with a glaucous bloom. A common shrub in swamps 6–12 feet high.

There are two varieties; one with nearly entire leaves; the other with finely serrate or toothed leaves, of a darker color.

6. *V. dentátum*.*Arrow-wood.*

Smooth; leaves roundish-ovate, sharply and coarsely serrate, acuminate, on long, slender petioles, with very prominent veins, shining above; flowers small, white, in smooth pedunculate cymes; fruit small, roundish, dark blue. A common shrub, 6–10 ft. high on river banks and in damp woods, with long, slender shoots, and light green leaves, with parallel veins. *June–July*.

ORDER LXI. Rubiaceæ.—Madder-family.

SYNOPSIS OF THE GENERA.

SUBORDER I. Stellatæ.

Leaves verticillate, Corolla rotate.

1. *GÁLUM*. Corolla 3–4 parted. Fruit in pairs. Herbs.

SUBORDER II. Cinchonæ.

Leaves opposite, Corolla with a manifest tube.

2. *MITCHÉLLA*. Flowers in pairs. Ovaries united, forming a single berry. Herbs.

3. *HEDRÔTIS*. Flowers not in pairs. Corolla with 4 spreading segments. Herbs.

4. *CEPHALÁNTHUS*. Flowers in globular heads. Corolla tubular, with 4 nearly erect segments. Shrubs.

1. GALIUM.

Calyx minute, with 3—4 teeth. Corolla rotate 3—4 cleft. Stamens 3—4 short. Styles 2. Fruit consisting of 2 united 1-seeded, indehiscent capsules. Stem 4-angled. Leaves verticillate. *Per.*

1. *G. asprillum.**Rough Cleavers.*

Stem weak, very branching, prickly backwards, supporting itself by its prickles; leaves in verticels of about 6 on the main stems, and 4 on the branches, oblong-lanceolate, or lanceolate, acuminate, with the mid-vein and margin prickly backwards; peduncles short, 2—3 flowered; flowers numerous, minute, white; fruit mostly smooth. A common plant in low grounds and thickets, climbing 4—6 ft. over shrubs and other plants by means of its hooked prickles. *July.*

2. *G. trifidum.**Goose-grass.*

Stem slender, decumbent, or nearly erect, weak, rough backward; leaves in whorls of 4—6, oblong-linear, or oblanceolate, obtuse, with rough margins; peduncles 1—3-flowered; pedicels slender; flowers white; the parts mostly in 3's, minute; fruit smooth. A common slender species, 4'—13' high, in wet grounds and swamps. Very variable.

Two varieties are found. Var. 1st. *Tinctorium.* Earlier leaves in 6's; those of the branches in 4's; root red, and is said to yield a permanent dye of that color. The plant is hence sometimes called "Dyers' Cleavers."

Var. 2d. *Obtusum.* Leaves oblanceolate, obtuse. Parts of the flowers in 4's. *June—Aug.*

3. *G. aparine.**Common Cleavers.*

Stem weak, reclining, prickly backward, hairy at the joints; leaves about 8 in a whorl, lanceolate, mucronate, rough on the edge and mid-vein; peduncles axillary, 1—2-flowered; flowers small, white; fruit large, hispid, with hooked prickles. An annual species, with stems 2—6 feet long, found in damp thickets. *June.*

4. *G. triflorum.**Three-flowered Cleavers.*

Stem weak, procumbent, or prostrate, rough backward on the angles; leaves mostly in 6's, oval-lanceolate, mucronate, rough on the margin; peduncles 3-flowered; flowers pedicellate, greenish; fruit hispid. Common in moist woods. Stem 1—3 feet long. *July.*

5. *G. boreale.**Northern Cleavers.*

Stem erect, smooth; leaves in 4's, linear-lanceolate, 3-nerved, smooth; flowers in a terminal, pyramidal, elongated panicle, white, small; fruit small, hispid. A species found on rocky banks of streams, distinguished from others of its tribe by the panicle of flowers. *July.*

6. *G. ciræans.**Wild Licorice.*

Stem erect, or ascending, mostly smooth, nearly or quite simple; leaves in 4's, ovate-lanceolate, or oval, generally obtuse, 3-veined, nearly smooth, ciliate; peduncles few-flowered, with mostly 2 divaricate branches and remote flowers, on short pedicels; flowers dark purple; fruit hispid. Common in woods, 6'—12' high. The leaves have a sweetish taste, similar to that of licorice, and hence its common name. *July.*

2. MITCHÉLLA.

Flowers in pairs, with united ovaries. Calyx 4-parted. Corolla funnel-shaped, bearded within, 4-lobed. Stamens 4, inserted on the corolla. Stigmas 4. Fruit a baccate drupe, crowned with the calyx-teeth of both flowers.

1. *M. repens.**Partridge-berry.*

Evergreen; stem creeping; leaves dark green, roundish-ovate, petiolate, opposite, with minute stipules; flowers white, or tinged with rose, fragrant, pedunculate 2 together, on a double ovary; berries small, bright red, edible but dry, persistent through the winter. A very pretty creeping plant in woods, with dark green, coriaceous leaves, which are usually marked with whitish lines. Common. *June—July.*

3. HEDYÔTIS.

Calyx 4-parted, persistent, inserted on the corolla. Stigmas 2. Capsule 2-celled, many-seeded.

1. *H. cœrulea.**Innocence.*

Smooth; stem slender, dichotomous; radical leaves spatulate, petiolate; cauline ones opposite, ovate-lanceolate, sessile, small; peduncles long, filiform, 1—2-flowered; corolla pale blue, fading to white, with a yellow base, somewhat

salver-form. A very delicate and elegant little plant, 2'—8' high, in moist grounds and grassy fields, growing in dense patches. Very common. *April—Sept.*

4. CEPHALÂNTHUS.

Calyx limb 4-toothed. Corolla tubular, slender, 4-toothed. Stamens 4. Style filiform, much exserted. Stigma capitate.

1. *C. occidentalis.**Button-bush.*

Leaves oval, entire, smooth, acute, petiolate, opposite, or in verticels of 3, with short stipules; flowers in large, terminal, globose, pedunculate heads, white. An elegant shrub, with smooth branches and foliage, distinguished from all others by its globular heads of flowers. Common in wet grounds, along streams, and on the borders of ponds. *July.*

ORDER LXIII. Dipsacæ.—Teasel-family.

1. DIPSACUS.

Flowers in heads. Involucre many-leaved, longer than the bracts of the flower; each flower with a 4-leaved involucre. Calyx-tube adhering to the ovary. Corolla tubular, 4-cleft. Stamens 4. Fruit 1-seeded, crowned with the calyx. *Per.*

1. *D. sylvestris.**Teazel.*

Prickly; leaves lanceolate-oblong, connate, toothed, or entire, opposite; heads cylindrical; leaflets of the involucre slender, longer than the head, bent inwards; bracts terminating in a long straight awn; flowers blue. A prickly plant, 2—4 feet high, naturalized in waste places. Very abundant in N. York, along the Erie canal. *July.*

ORDER LXIV. Compositæ.—Composite-family.

SYNOPSIS OF THE GENERA.

SUBORDER I. Tubulifloræ.

Flowers either with tubular corollas, or only the marginal ones ligulate and pistillate or sterile.

*A. Flowers all tubular.**a. Leaves all alternate.*

GROUP. 1.

Marginal and central flowers similar, and all perfect. Leaves not prickly. 1. *VERONIA.* Heads erect, many-flowered, in corymbs. Pappus double. Receptacle naked. Achenia cylindrical.

4. *LIATRIS.* Heads erect, few to many-flowered, in elongated racemes. Pappus plumose. Receptacle naked. Achenia tapering at base.

30. *SENÉCIO.* Heads nodding, loosely corymbose. Receptacle not chaffy.

Pappus simple, soft, capillary.

43. *XERANTHEMUM.* Heads large, terminal, solitary, erect. Disk flowers yellow, surrounded by a conspicuously-colored involucre. Receptacle chaffy.

46. *LAPPA.* Heads erect, irregularly panicled. Involucre scales tipped with hooked prickles. Pappus bristly. Receptacle bristly.

GROUP 2.

Marginal and central flowers both similar and perfect. Leaves prickly.

42. *CARTHAMUS.* Heads orange colored. Receptacle covered with setaceous chaff. Pappus none.

44. *ONOPORDON.* Heads purple. Receptacle deeply alveolate. Pappus mostly capillary, not plumose. Achenia 4-angled, wrinkled.

45. *CIRSIUM.* Heads purple, or yellowish-white. Receptacle bristly. Pappus plumose. Achenia compressed, smooth.

GROUP 3.

Central flowers perfect. Marginal flowers pistillate.

15. *PLŪCHEA.* Heads purple, corymbed. Central corollas 5-cleft; marginal ones filiform, truncate. Receptacle flat. Pappus capillary.

31. *ARTEMISIA.* Heads small, in more or less paniculate racemes. Receptacle nearly flat. Pappus none.

32. *TANACETUM.* Heads yellow, in flat-topped corymbs. Receptacle convex. Pappus reduced to a small membranous border.

83. *GRAPHALIMUM.* Heads yellowish-white, surrounded by scarious, white, or colored involucre-scales, in several rows, densely clustered, or corymbed. Receptacle flat. Woolly herbs.

85. *ERECTHITES.* Heads whitish, in a dense paniculate corymb. Involucre

cylindrical, with the linear, green scales in a single row. Pappus abundant, white, very soft.

GROUP 4.

Central flowers perfect; marginal mostly enlarged and sterile.

40. *CENTAUREA*. Receptacle bristly. Pappus composed of capillary, rough bristles, in several rows.

41. *ANDREREA*. Pappus consisting of oblong, or obovate, chaffy scales; rarely small or none.

GROUP 5.

Heads consisting wholly of either staminate or pistillate flowers (rarely in *Antennaria* a few staminate flowers in the centre of the pistillate heads).

34. *ANTENNARIA*. Plants with dioecious flowers. Receptacle somewhat convex, alveolate. Woolly herbs.

36. *XANTHIUM*. Plants with monœcious flowers. Staminate in short, terminal racemes; pistillate ones in small clusters, at the base of the staminate. Fertile heads 2-flowered, covered with hooked prickles, forming a burr. Pappus none.

37. *AMBROSIA*. Flowers monœcious. Sterile flowers nodding, in long racemes. Fertile flowers in a closed, 1-flowered involucre, axillary, near the base of the sterile raceme.

b. Lower leaves at least opposite or verticillate.

GROUP 6.

Central and marginal flowers perfect.

2. *EUPATORIUM*. Heads 3—many-flowered. Involucre-scales 8 or more. Pappus simple, capillary. Receptacle naked. Erect herbs.

8. *MIKANIA*. Heads 4-flowered. Involucre-scales 4. Receptacle naked. Pappus simple, capillary. Climbing herbs.

20. *BIDENS*. Heads many-flowered. Receptacle chaffy. Pappus consisting of 2—4, stiff, barbed awns.

GROUP 7.

Central flowers staminate; marginal ones pistillate, fertile.

38. *IVA*. Heads small, on short recurved peduncles, racemose, forming leafy panicles. Shrubby at base.

B. Central flowers tubular; marginal or ray flowers ligulate.

a. Leaves all alternate or radical.

GROUP 8.

Rays yellow, pistillate. Disk-flowers perfect.

13. *SOLIDAGO*. Heads small. Rays about 5, short. Involucre-scales imbricate. Receptacle flat, alveolate.

14. *INULA*. Heads very large. Rays very numerous. Involucre-scales imbricate. Receptacle flat.

21. *HELLENTHUM*. Rays numerous, 3—5-cleft at summit. Involucre of reflexed scales. Receptacle subglobose, naked.

30. *SENÉCIO*. Heads in flat corymbs. Involucre-scales in a single row. Rays entire. Receptacle flat.

GROUP 9.

Rays not yellow, pistillate. Disk-flowers perfect.

* Receptacle alveolate.

6. *ASTER*. Heads corymbose or paniculate. Pappus simple, capillary. Achenia compressed, smooth.

7. *SERICOCARPUS*. Heads corymbose. Pappus simple, capillary. Achenia obovate, densely silky.

8. *DIPLOREPUS*. Heads rather large, corymbose, or solitary. Involucre scales appressed. Pappus double; outer series very short; inner of capillary bristles.

10. *CALLISTEPHUS*. Heads very large, solitary on the branchlets. Involucre scales with large, leafy, spreading tips. Pappus double; outer series of short, chaffy scales; inner series of long capillary, deciduous bristles.

13. *SOLIDAGO*. Heads small, in axillary racemes. Rays few, short. Pappus simple, capillary.

** Receptacle naked.

9. *EUTOBERON*. Ray flowers very numerous and narrow. Pappus simple or double. Receptacle flat.

11. *BELLIS*. Leaves all radical. Heads solitary. Receptacle conical. Pappus none.

25. *LEUCANTHEMUM*. Involucre broad, depressed at the centre. Pappus none.

26. *PYRÆTHEUM*. Involucre hemispherical. Pappus reduced to a membranous border or crown.

27. *CHRYSANTHEMUM*. Involucre hemispherical. Pappus none.

*** Receptacle chaffy.

22. *ANTHEMIS*. Rays numerous. Receptacle convex. Pappus reduced to a slight border, crowning the achenia.

24. *ACHILLEA*. Rays 5—10. Receptacle flat. Pappus none.

GROUP 10.

Rays neutral. Disk flowers perfect.

23. *MARÏTA*. Receptacle conical, more or less chaffy. Rays white.

17. *RUDBÉCKIA*. Involucre-scales in 2 series. Receptacle conical, chaffy. Pappus none, or a mere border. Rays yellow.

GROUP 11.

Rays pistillate. Disk-flowers staminate.

5. *TUSSILAGO*. Acaulescent. Rays very narrow, in many rows.

89. *CALÉNDULA*. Involucre-scales nearly equal, in 2 rows. Pappus none.
b. Lower leaves, at least, opposite.

GROUP 12.

Rays pistillate. Disk-flowers perfect.

12. *DANILIA*. Involucre-scales in 2 rows. Receptacle chaffy. Pappus none. Leaves pinnate.

16. *HELIOPSIS*. Involucre-scales imbricated in several rows. Receptacle chaffy, conical. Pappus none.

18. *ZINNIA*. Involucre-scales imbricated in several rows. Receptacle chaffy, conical. Pappus of the disk consisting of 2 erect awns. Leaves entire.

20. *TAGÈTES*. Involucre-scales in 1 row. Receptacle naked. Pappus of 5 erect awns. Leaves pinnately-parted.

GROUP 13.

Rays neutral. Disk-flowers perfect.

19. *HELIANTHUS*. Involucre-scales in several rows. Receptacle with persistent chaff. Pappus persistent, of 2 deciduous, chaffy awns.

28. *CORÉOPSIS*. Involucre-scales in 2 series. Receptacle with deciduous chaff. Achenia compressed. Pappus reduced to 2 teeth, or none.

29. *BIDENS*. Involucre-scales in 2 series. Receptacle chaffy. Pappus consisting of 2—4 barbed awns. Achenia quadrangular.

SUBORDER II. Ligulifloræ.

Flowers all ligulate.

GROUP 1.

Plants acaulescent.

48. *KRIGIA*. Involucre-scales equal, in 2 rows. Achenia turbinate. Pappus double; outer series of broad scales; inner of slender bristles.

49. *LEONTODON*. Involucre-scales imbricate; outer ones very short. Pappus plumose; bristles in a single series. Achenia scarcely beaked.

55. *TARAXACUM*. Involucre-scales in 2 series; inner series appressed; outer reflexed. Achenia with a long beak, bearing a capillary, copious pappus.

GROUP 2.

Plants caulescent. Heads yellow.

53. *HIERACIUM*. Achenia oblong, not beaked. Pappus-bristles tawny, capillary, in a single series. Leaves toothed or entire.

51. *LACTUCA*. Achenia compressed, with a long filiform beak. Pappus very abundant, white and soft.

56. *SONCHUS*. Achenia compressed, not beaked. Pappus very abundant, white, soft, capillary.

GROUP 3.

Plants caulescent. Heads not yellow.

47. *CICHORIUM*. Involucre-scales in 2 series. Pappus of very short scales. Achenia not beaked. Leaves runcinate.

50. *TRAGOPOGON*. Involucre-scales in a single series. Achenia with a long, filiform beak. Pappus plumose. Leaves linear.

52. *MULGÉDIUM*. Involucre-scales in 2 series; outer ones short. Achenia flatfish, with short thick beaks. Pappus soft, capillary.

54. *NARAIUS*. Involucre-scales cylindric, in a single row, with a few appressed bractlets at base. Achenia not beaked. Heads mostly in axillary racemes.

1. VERNÓNIA.

Heads 15—many-flowered. Involucre of many ovate, appressed, imbricated scales, shorter than the flowers. Receptacle naked. Achenia cylindrical, ribbed. Pappus double; the outer short, chaffy; the inner capillary. *Per.*

1. V. Noveboracensis.

Iron-weed.

Stem erect, branching above; leaves alternate, lanceolate, serrulate, pubescent underneath; heads rather large, dark purple, in terminal, compound, flat-topped cymes; scales of the involucre terminating in a long awn, or bristle-like appendage. A tall plant, 4—6 feet high, in swamps, with numerous dark purple heads. Quite showy. *Aug.—Sep.*

2. EUPATORIUM.

Heads 3—many-flowered. Involucre cylindrical, imbricate, Receptacle flat. Style much exsert. Pappus simple, roughish. Achenia 5-angled. *Per.*

1. E. purpureum.

Trumpet-weed.

Stem tall, simple; leaves varying from broad-ovate to lanceolate, acnninate, veiny, somewhat rough, serrate or toothed, 3—6 in a whorl; heads 5—10-flowered; scales of the involucre purplish, numerous, closely imbricated in several rows of unequal length; flowers light purple, in dense compound corymbs. An exceedingly variable plant. The stem ranges from 2—10 feet high, is solid or hollow, spotted or without spots, and sometimes dotted; leaves also variable in shape and size. Low ground. Very common. *Aug.—Sep.*

2. E. teucrifolium.

Pubescent and somewhat rough; leaves opposite, ovate or ovate-lanceolate, obtuse at base, sessile, veiny; upper ones alternate and nearly entire; heads in corymbs, with a few unequal branches, about 8-flowered, white; scales about

10, in 2 rows, oblong-lanceolate, at length shorter than the flowers. A rough, hairy plant, 2–3 feet high, with a somewhat paniculate corymb. Low grounds near the coast. *Aug.*

3. *E. sessilifolium*. *Sessile-leaved Eupatorium*.

Stem slender, branching above, smooth; leaves opposite, sessile, ovate-lanceolate, or lanceolate, rounded at base, tapering to the extremity, smooth, serrate; heads white, in compound, pubescent corymbs, about 5-flowered; scales of the involucre oval, or oblong, obtuse. A slender species, 2–4 feet high, not uncommon in rocky woods. *Aug.—Sep.*

4. *E. pubescens*. *Hairy Eupatorium*.

Pubescent; leaves opposite, sessile, ovate, acute, serrately toothed, rough, velvety, pubescent; heads white, in a fastigate corymb, 7–8-flowered; scales of the involucre lanceolate, acute, pubescent. A rough species, 3–4 feet high, not uncommon near the coast. *Aug.*

5. *E. perfoliatum*. *Boneset*.

Stem erect, stout, rough, hairy; leaves lanceolate, acuminate, connate-perfoliate, very pubescent, serrate; heads white, about 12-flowered, in a flat-topped, pubescent corymb; scales of the involucre linear-lanceolate. A very rough, hairy species, universally known and marked by the opposite leaves united at base, so perfectly as to seem but one. Very common in low grounds. *Aug.—Sep.*

6. *E. ageratoides*. *Nettle-leaved Eupatorium*.

Stem smooth, branching; leaves broad-ovate, acuminate, sub-cordate at base, coarsely toothed, on long petioles, mostly smooth; heads white, with 12 or more flowers, in compound corymbs; involucre scales in 1 row. A large-leaved species, nearly smooth, with white scentless flowers in clusters, arranged in a corymb. Stem 1–4 feet high. Rocky woods. *Aug.—Sep.*

7. *E. aromaticum*. *Aromatic Eupatorium*.

Smooth or somewhat pubescent; stem nearly simple; leaves ovate, sub-cordate at base, on short petioles, opposite, acute, obtusely serrate; involucre simple, pubescent; heads large, 10–16-flowered, white, aromatic, in small corymbs. An elegant species, resembling the last, but distinguished by its short petioles, blunt teeth, and aromatic flowers. Low woods. *Aug.—Sep.*

8. MIKANIA.

Involucre about 4-leaved. Heads with about 4 flowers. Receptacle naked. Pappus simple, capillary, roughish. Achenia 5-angled. *Per.*

1. *M. scandens*. *Climbing Mikania*.

Smooth; stem climbing; leaves opposite, cordate, petiolate, repandly dentate, acuminate; heads in numerous, axillary, pedunculate corymbs; flowers pale pink or flesh color. A rather elegant, climbing plant, in wet thickets, with flowers much resembling those of *Eupatorium*. Not very common. *Aug.—Sep.*

4. LIATRIS.

Heads few to many-flowered. Involucres imbricate, with appressed scales. Pappus abundant, more or less plumose. Achenia tapering at base, 10-ribbed. Styles much exserted. *Per.*

1. *L. Scariosa*. *Blazing Star*.

Stem erect, simple, rough, pubescent; lower leaves lanceolate, on long petioles; upper ones linear, and smaller; heads large, purple, 20–40-flowered, in a long, terminal raceme, pedicellate, rather remote; involucre somewhat hemispherical; scales obovate, very obtuse, with scarious and often purplish tips. A very beautiful plant, 2–4 feet high, in dry sandy soils, but not very common. Distinguished by its long racemes of large purple heads and its numerous, scattered, narrow leaves. *Aug.—Sep.*

5. TUSSILAGO.

Heads many-flowered. Ray-flowers narrow, in many rows, pistillate. Disk-flowers few, staminate. Involucre mostly simple. Receptacle naked, flat. Pappus capillary. *Per.*

1. *T. Farfara*. *Coltsfoot*.

Acaulescent; rhizoma creeping; leaves large, cordate, angular, toothed, dark green above, and with the petioles, downy beneath; scapes simple, 1-flowered, scaly, preceding the leaves; flowers yellow, with numerous, very narrow rays. A low plant found in clayey soils, and producing its flowers in early spring before the leaves. *April.*

6. ASTER.

Heads many-flowered. Involucre scales generally imbricate, often with herbaceous tips. Ray-flowers pistillate, fertile, in a single row. Disk-flowers tubular, perfect. Receptacle flat, alveolate. Pappus simple, capillary. Achenia usually compressed. *Per.*

1. *A. corymbosus*. *Corymbed Aster*.

Stem slender, flexuous, smooth, with pubescent branches; leaves ovate, sharply and irregularly serrate, strongly acuminate, nearly smooth; lower and radical ones cordate, petiolate; uppermost ovate-lanceolate, sessile; petioles naked; involucre of closely appressed, obtuse scales; rays 6–9 narrow. A common species, with flat corymbs of white flowers, of a much slenderer and smoother habit than the next. Dry woods and thickets. *Aug.*

2. *A. macrophyllus*. *Large-leaved Aster*.

Stem stout, branched, not flexuous; leaves rough, finely serrate, somewhat acuminate; lower ones large, cordate, on long petioles; upper ones ovate or oblong, sessile, or on winged petioles; heads in large, flat corymbs; rays 12–15, white or bluish; involucre with oblong, acute scales. A much larger and stouter plant than the last. Stem 1–2 feet high. Common in woods and thickets. *Aug.—Sep.*

3. *A. cordifolius*. *Heart-leaved Aster*.

Stem erect, mostly smooth, with many divaricate branches above; leaves cordate, sharply serrate, hairy beneath, acuminate, on slender, somewhat margined and hairy petioles; heads racemed on the branches; rays 10–15, pale blue; involucre-scales appressed, with short green tips. A common species, 2 feet high, in rocky woods, bearing a long compound panicle of numerous, pale blue flowers.

4. *A. undulatus*. *Variable Aster*.

Pubescent and somewhat hairy; stem erect, panicle above; lower leaves cordate, somewhat serrate, on winged petioles; upper ones ovate or ovate-lanceolate, undulate, or slightly serrate, on short, broadly margined petioles, which are dilated and clasping at base, or sessile, cordate and clasping at base; all somewhat rough above, pubescent beneath; heads solitary, in somewhat unilateral racemes, arranged in a terminal panicle; rays pale blue. A rough species, distinguished by its variable leaves on the same plant. Common in dry woods and thickets. *Aug.—Sep.*

5. *A. patens*. *Spreading Aster*.

Pubescent and somewhat rough; stem branching, paniculate above; leaves oblong-ovate, or oblong, sessile, cordate and clasping the stem at base, rough above and on the margin, entire; heads large, with very showy violet-purple rays, solitary, on leafy branchlets, forming a loose, terminal panicle; involucre-scales lanceolate, with spreading, green tips; achenia silky. A very common and elegant species, 2–3 feet high, in dry fields and thickets. Distinguished by its conspicuously clasping leaves, which, at a little distance appear perfoliate. In moist grounds the leaves often taper somewhat toward the base. *Aug.—Oct.*

6. *A. laevis*. *Smooth Aster*.

Very smooth and often glaucous; stem angular; leaves lanceolate, or ovate-lanceolate, somewhat fleshy, mostly entire; the upper ones somewhat cordate, or auriculate at base; the lower and radical ones tapering to a winged petiole; involucre-scales with broad-linear, appressed, green tips; heads large, solitary, at the ends of the branchlets, with bright blue, showy rays, forming a terminal panicle. A very beautiful species, 2–3 feet high, in low grounds. Distinguished by its entire smoothness and generally glaucous appearance. Common. *Sep.—Nov.*

7. *A. puniceus*. *Rough Aster*.

Stem erect, very branching, pubescent, rough, paniculate above; leaves lanceolate, auriculate and clasping at base, slightly serrate, pubescent, rough above, nearly smooth beneath, acuminate; heads large, with very numerous and narrow, pale-purple rays, showy, forming a very large and leafy panicle; involucre-scales narrow-linear, long and revolute in 2 rows. A showy species, with a rough stem generally red on one side, and scarious. Leaves serrate in the middle. Swamps and low grounds. Very common. *Sep.—Oct.*

8. *A. Novæ Angliæ*. *New England Aster*.

Stem stout, hispid, paniculate above; leaves lanceolate, entire, acute, auriculate and clasping at base, somewhat pubescent, thickly clothing the stem;

heads large, with numerous, deep-purple rays, somewhat paniculately corymbose; involucre-scales linear-lanceolate, longer than the disk, mostly in a single row, viscid-pubescent, as well as the brachlets. A very ornamental species in moist grounds, not very common in N. Eng., but abundant westward. *Sep.*

9. *A. miser.**Starved Aster.*

Stem more or less pubescent, generally very branching; leaves lanceolate, or oblong-lanceolate, tapering at base, acuminate, acutely serrate in the middle; heads small, racemose on the branches, often scattered; rays very short, bluish or white; involucre-scales linear, acute, or somewhat obtuse, in 3–4 rows. A very common and extremely variable species, in thickets and fields, varying in size according to the soil, 5'–30'. *Sep.–Oct.*

10. *A. Tradescánti.**Narrow-leaved Aster.*

Nearly or quite smooth; stem terete, with virgate, erect, spreading or diverging branches; leaves linear-lanceolate, the lower ones commonly serrate in the middle, the others entire; heads very numerous, rather small, mostly with rays, densely racemose on the branches; involucre-scales narrow-linear, more or less acute, in 3–4 rows. A very common species in moist fields, distinguished from the last by its much narrower leaves and involucre-scales, and its numerous, densely racemose heads. Very variable. *Aug.–Oct.*

11. *A. simplex.**Willow-leaved Aster.*

Nearly or quite smooth; stem tall, very branching; leaves lanceolate, acuminate, lower ones serrate, upper entire; heads medium size, rather few, racemose on the branches, forming a terminal, leafy panicle; involucre-scales linear, subulate, loosely imbricated. Another very variable species, with pale blue or whitish flowers. In low grounds. Common. *Sep.*

12. *A. dumosus.**Bushy Aster.*

Nearly or quite smooth; stem branching, paniculate; leaves linear, those of the branches much smaller, oblong, rough on the margin, crowded, entire; lower ones sometimes serrate; heads medium size, with pale purple, or whitish rays, racemose on the branches, mostly solitary on the brachlets; involucre-scales closely imbricate, broader at summit, obtuse, in 4–6 rows. A variable and rather handsome species, common in thickets and fields. *Sep.*

13. *A. multiflorus.**Many-flowered Aster.*

Pubescent and somewhat rough; stem very branching; leaves linear, crowded on the stem, entire, sessile, those of the branches much smaller; heads small, with white rays, very numerous, densely racemose on the spreading branches; involucre-scales linear-spatulate, with spreading, green tips. An ornamental species with very dense panicles of innumerable white flowers. Dry soils. Common. Stem 1–2 ft. high, bushy. *Sep.*

14. *A. longifolius.**Long-leaved Aster.*

Nearly or quite smooth: stem very branching, corymbosely paniculate above; leaves linear-lanceolate, or linear, lower ones sometimes ovate-lanceolate, entire, or remotely serrate in the middle, smooth and shining above; heads large, numerous, with many light-purple rays, racemose on the branches; involucre-scales in 3–5 rows, linear, with acute, spreading, or recurved, green tips. A very handsome species, 2–5 ft. high, in moist grounds; often with a purple, flexuous stem. Extremely variable in foliage and size. Common. *Sep.–Oct.*

15. *A. flexuosus.**Marsh Aster.*

Stem slender, branching, flexuous, very smooth; leaves linear, long and fleshy, acuminate, entire, upper ones subulate; heads large, with purple rays and yellow disk, solitary on the leafy brachlets; involucre-scales in many rows, ovate-lanceolate, appressed, acuminate. A common species in salt marshes; about 1 ft. high. *Aug.–Oct.*

16. *A. linifolius.**Sea Aster.*

Stem very branching, paniculate, with nearly erect branches; leaves linear-lanceolate, acuminate, entire, fleshy, those on the branches subulate; heads small, racemose, or paniculate on the branches, numerous; rays short, not projecting beyond the disk, purplish, somewhat in 2 rows; involucre cylindric, with subulate scales, in few rows. An annual species, 1–2 ft. high, found in salt marshes. *Aug.–Sep.*

7. SERICOCARPUS.

Heads 12–16-flowered. Ray-flowers 4–6, perfect. Disk-flowers 6–10. Involucre oblong, with imbricated, appressed, green-tipped scales. Receptacle alveolate. Achenia obconic, very silky. Pappus simple, with capillary bristles. *Per.*

1. *S. conyzoides.**White-topped Aster.*

Somewhat pubescent, simple, corymbose above; leaves oblong-lanceolate, lower often spatulate, smooth beneath, veiny, narrowed at base, serrate toward the apex, the upper ones sessile, nearly entire, lower petiolate; heads small with short, white rays, and pale yellow disk, in loose flat corymb; involucre-scales appressed, whitish, with recurved tips; pappus rust color. A common plant, 1–2 ft. high, in dry woods and thickets. *July.–Aug.*

8. DIPLOPAPPUS.

Heads many-flowered. Rays 8–12, pistillate. Disk-flowers perfect. Involucre imbricate, with appressed scales, destitute of green tips. Receptacle flat, alveolate. Pappus double, the exterior of very short and stiff bristles; interior copious, capillary. *Per.*

1. *D. linariifolius.**Bristly Aster.*

Stems long, often decumbent, somewhat rough, leafy, several from the same root; leaves linear, 1-veined, rigid, smooth, shining above, very rough on the margins, ending in a mucronate point; heads large, with numerous, deep-blue, showy rays, solitary on the ends of the pubescent branches. A fine plant, about 1 ft. high, with very showy flowers. Common in dry soils. *Sep.*

1. *D. umbellatus.**Umbelled Aster.*

Smooth; stem tall, leafy; leaves lanceolate, entire, acuminate, attenuate at base, rough on the margin; heads very numerous, with white rays and yellow disk, in a terminal, flat corymb; involucre-scales somewhat closely imbricated and obtuse, oval-lanceolate. A tall, elegant species, 4–6 ft. high, often with a purplish stem, and supporting a large, level corymb of white flowers. Common in low grounds. *Aug.–Sep.*

9. ERIGERON.

Heads many-flowered, somewhat hemispherical. Rays narrow, very numerous, pistillate. Disk-flowers perfect. Receptacle flat, naked. Involucre nearly in 1 row, with narrow, subequal scales. Pappus mostly simple.

1. *E. bellidifolium.**Robin's Plantain.*

Hairy; stem simple, nearly naked above; radical leaves obovate, obtuse, slightly serrate, cauline ones distant, oblong-lanceolate, mostly clasping, entire, acute; heads large, with 60–70 broadly-linear, bluish-purple rays, in a close, terminal corymb. A common and early species, 1–2 ft. high, in fields and thickets. *May–June. Per.*

2. *E. Philadelphicum.**Purple Fleabane.*

Hairy; stem slender, leafy; leaves thin, oblong, clasping at base, mostly entire; heads with exceedingly numerous and narrow, reddish-purple, or flesh-colored rays, broadly corymboid at the summit of the stem. A common species in thickets and fields, 1–3 ft. high. *June–Aug. Per.*

3. *E. annuum.**Daisy Fleabane.*

Stem tall, furrowed, rough, pubescent, branching; leaves hairy, closely serrate, the lowest ovate, tapering into a winged petiole; upper ones ovate-lanceolate, crowded, acute, tapering at base, sessile, the uppermost lanceolate; heads large, with very numerous, narrow, and short, white rays, tinged with purple, corymbose at the summit of the stem. A tall plant, growing as a weed in fields and waste places. Very common. *August. An. and Bien.*

4. *E. strigosum.**White-weed.*

Stem erect, branching, slender, furrowed, more or less pubescent and rough; leaves mostly entire, tapering at both ends, lowest ones oblong, or spatulate, 3-veined, attenuate to a petiole, upper ones lanceolate; heads small, with rays twice as long as the involucre, and a yellow disk, in large, loose, terminal, paniculate corymb. A weed in fields, equally common with the last, about 2 ft. high, and a much more slender plant. *June–Sep. An. or Bien.*

5. *E. Canadense.**Fleabane.*

Hairy; stem erect, furrowed, with numerous short branches; leaves linear-lanceolate, or linear, mostly entire, radical ones incised; heads very numerous, small, with numerous white rays scarcely longer than the involucre, racemose on the branches, forming a long, terminal panicle. A common weed in waste places, varying greatly in size and form, 6'–6 ft. in height. *July.–Oct. An. and Bien.*

10. CALLISTEPHUS.

Ray-flowers pistillate, numerous; disk-flowers perfect. Involucre hemispherical. Receptacle somewhat convex. Pappus

double; outer series short, setaceous, and with the chaff united into a crown; inner series with filiform, deciduous bristles. *An.*

1. *C. Chinensis**China Aster.*

Stem hispid with divergent branches; leaves alternate, coarsely toothed, petiolate, cauline ones sessile, tapering at base; heads large, with numerous rays, solitary on the extremities of the branches. Common in cultivation, where many varieties occur, ranging through all the shades of red and purple, from deep-blue to pure white.

11. *BELLIS.*

Heads many-flowered. Rays pistillate. Disk perfect. Involucre hemispherical, of equal scales. Receptacle conical, somewhat alveolate. Pappus none. *Per.*

1. *B. perennis.**English Daisy.*

Acaulescent; root creeping; leaves obovate, crenate; scape naked, 1-flowered. A beautiful little European plant, not uncommon in cultivation, with a scape 3'-4' high, bearing a solitary white flower; in cultivation double, or quilled. Varieties in respect to color are also produced.

12. *DÁLILIA.*

Heads many-flowered. Disk-flowers pistillate. Involucre double. Scales of the outer series double and distinct, of the inner 8 in number, and united at base. Receptacle chaffy. Pappus none. *Per.*

1. *D. variabilis.**Dahlia.*

Stem smooth, green; leaves pinnate, opposite; leaflets about 5, ovate, acuminate, nearly or quite smooth, with their common stalk winged; outer involucre reflexed. Very common in cultivation, where it is usually double, and sports into many varieties of almost every color and combination of colors, except blue; stem 4-6 ft. high. *July.—Sep.*

13. *SOLIDAGO.*

Heads few or many-flowered. Ray-flowers about 5, pistillate. Disk-flowers perfect. Involucre with imbricate, appressed scales. Receptacle small, alveolate. Pappus simple, capillary. Achenia nearly round, with wavy ribs. Heads, with 1 exception, yellow. *Per.*

1. *S. lanceolata.* *Narrow-leaved Golden-rod.*

Stem angular, hairy, very branching; leaves linear-lanceolate, acute, entire, 3-veined, slightly pubescent on the veins and margin; heads rather small, in dense, terminal, flat corymbs; rays 15-20. A common and somewhat fragrant species, in low grounds, 2-4 feet high, distinguished from most other *Solidagos* by its flat corymbs. *Sep.*

2. *S. cæsia.**Blue-stemmed Golden-rod.*

Stem round and glaucous, often flexuous; leaves lanceolate, serrate, acuminate, sessile; heads with 5-7 rays, in axillary, crowded, racemose clusters. A handsome species, 3-4 feet high. Stem generally purplish, slender, with axillary racemes through a great portion of its length. Common in moist woods. *Sep.*

3. *S. latifolia.**Broad-leaved Golden-rod.*

Nearly, or quite smooth; stem angular, somewhat flexuous, simple, or slightly branched above; leaves large, broad-ovate, tapering at both ends, deeply and sharply serrate, with margined petioles; heads small, greenish-yellow, in very short, axillary, sessile, or long, terminal racemes. A very distinct species, 1-2 feet high. Not uncommon along the rocky banks of streams, or in dry rich woods. *Sep.*

4. *S. bicolor.**White-rayed Golden-rod.*

Pubescent; stem mostly simple; leaves oblong, or oblong-lanceolate, acute at each end; lower ones oval and petiolate, slightly serrate; heads in numerous, erect, densely flowered, axillary, racemose clusters, forming a long terminal, interrupted spike; involucre-scales ovate, obtuse; rays short, pale cream-color, or white, about 8 in number. A common and well marked species, of a somewhat hoary appearance, easily distinguished from all other species by its whitish rays. Dry fields and woods. *Aug.—Sep.*

5. *S. speciosa.**Showy Golden-rod.*

Stem stout, smooth, simple; leaves thick, smooth, rough on the margin, oval or ovate-lanceolate; upper ones oblong-lanceolate, entire sessile; lower tapering into a winged petiole, slightly serrate; heads numerous, with about 5 bright yellow, large rays, in numerous densely crowded, erect racemes, forming

a long, showy, thyrsoid panicle. A tall and very handsome species, 4-6 feet high. Not uncommon in woods. *Aug.—Sep.*

6. *S. nemoralis.**Gray Golden-rod.*

Pubescent; stem mostly simple; leaves oblanceolate, entire; lower ones oblong-spatulate, somewhat serrate, petiolate; heads small, with 6-9 deep-yellow rays, in dense, and finally recurved racemes, forming a close panicle, which is usually recurved; involucre-scales oblong-linear, appressed. A common species in dry soils, 1-2 feet high, of a grayish and somewhat stunted appearance, with a large panicle of deep yellow flowers. *Sep.*

7. *S. serotina.**Smooth Golden-rod.*

Stem tall, smooth, often glaucous; leaves lanceolate, acuminate, serrate, rough above and on the margin, hoary on the veins beneath; heads small, with short rays, in dense flowered, paniculate racemes. A tall and variable species, in low grounds, 3-6 feet high, with a more or less dense, recurved panicle. Common. *Sep.*

8. *S. Canadensis.**Canadian Golden-rod.*

Stem tall, hairy; leaves lanceolate, serrate, rough above, more or less pubescent beneath; heads small, very numerous, with very short, inconspicuous rays, in a large, recurved panicle. A tall, variable species, common in the borders of thickets and fields. One variety has the stem and under surface of the leaves woolly; another has the leaves very rough above, entire and rugose. *Aug.—Oct.*

9. *S. gigantea.**Large Golden-rod.*

Stem stout, smooth, often glaucous; leaves lanceolate, nearly or quite smooth on both sides, acuminate, sharply serrate, tapering and entire at base, and ciliate on the margin; panicles large, with pubescent branches; heads larger than in the last, with rather long rays, numerous. A large and variable species, with a showy panicle, 4-6 feet high. Common in low grounds, and along fences. *Aug.—Oct.*

10. *S. sempervirens.**Evergreen Golden-rod.*

Smooth; stem stout, purplish, often somewhat glaucous; leaves lanceolate, somewhat fleshy, sessile and slightly clasping at base, entire and rough on the margin; heads large, with 8-10 long, narrow, bright yellow rays, racemose, in a more or less contracted panicle. A common species, 2-6 feet high, in brackish swamps and salt marshes, with large heads, and long, narrow, radical leaves. *Sep.*

11. *S. odora.**Spicy Golden-rod.*

Nearly or quite smooth; stem slender, erect, or reclined; leaves linear-lanceolate, entire, shining above, very smooth, with pellucid dots; heads small, with 3-4 rays, in short, spreading racemes, forming rather small, unilateral panicles. An elegant species, distinguished by the fragrance of its leaves, which have the odor and flavor of anise. Common. *July.—Sep.*

12. *S. arguta.**Sharp-toothed Golden-rod.*

Smooth; stem erect, thick, furrowed; leaves sharply serrate, with diverging teeth, acuminate, tapering at base; lower and radical ones oval-lanceolate, or lanceolate, attenuate to margined and ciliate petioles; cauline ones lanceolate, or oblong, the highest entire, small; heads medium size, with about 10 rays, in dense, long, recurved racemes, forming a 1-sided, flat, corymbose panicle. A very common and variable species, in woods and fields, distinguished by its large panicle and recurved racemes. *July.—Sep.*

13. *S. altissima.**Rough Golden-rod.*

Pubescent; stem erect, rough, branching above; leaves ovate-lanceolate, or oblong, sharply serrate, rough, especially above; upper ones acute, or acuminate, often thick in texture, and rugose; racemes paniculate on the spreading branches; heads small, with 6-8 rays; involucre-scales linear. A tall, rough species, 4-6 feet high; extremely variable. Common in the borders of fields and thickets. The stem is thickly clothed with rough leaves, and is very branching above, with large, more or less recurved panicles. Distinguished especially by its rough stem and leaves. *Sep.—Oct.*

14. *INULA.*

Heads many-flowered. Involucre imbricate. Rays numerous, in one row, pistillate. Disk-flowers perfect. Receptacle naked. Pappus simple, capillary. *Per.*

1. *I. Helénium.**Elecampane.*

Stem stout, furrowed, branching and woolly above; leaves ovate, downy beneath; radical ones very large, petiolate, serrate; cauline ones clasping; heads

very large, solitary, terminating the branches; rays linear, light yellow, 2-3-toothed at apex; involucre-scales ovate, foliaceous. A stout, herbaceous plant, 4-6 ft. high, with very large flowers and radical leaves, the latter often 1 ft. long. Common by road-sides. Introduced. *July-Aug.*

15. PLÜCHEA.

Heads many-flowered; flowers all tubular, those of the margin pistillate and fertile, with a filiform truncate corolla; those of the centre perfect, few, with a 5-cleft corolla. Involucre imbricated. Receptacle flat, naked. Style undivided. Achenia sulcate. Pappus simple, capillary. *Per.*

1. *P. camphorata.**Marsh Fleabane.*

Somewhat viscid-pubescent; leaves ovate-lanceolate, or lanceolate, thick, serrate, acute, on very short petioles; heads rather large, light purple, arranged in crowded, flat, terminal corymbs. A coarse and fleshy plant of the salt marshes, about 1 ft. high, exhaling a strong and somewhat disagreeable camphoric odor. *Aug.*

16. HELIOPSIS.

Heads many-flowered; rays 10 or more, pistillate, fertile. Disk-flowers perfect. Involucre-scales in 3 rows. Receptacle chaffy, conical. Achenia 4-sided. Pappus none. *Per.*

1. *H. lævis.**Ox-eye.*

Nearly or quite smooth; leaves ovate-oblong, or ovate-lanceolate, opposite, petiolate, 3-nerved, serrate; lower ones more or less truncate at base; heads large, showy, with yellow rays, solitary, pedunculate, terminating the stem and branches; rays linear, broader at base, obtuse at apex. A large, elegant plant, with showy flowers, 2-5 ft. high, in thickets and along fences. Common in N. York, and some portions of N. England. Var. *scabra* has the foliage somewhat rough. *June-Aug.*

17. RUDBECKIA.

Heads many-flowered. Rays neutral. Disk perfect. Involucre-scales foliaceous, in 2 rows. Receptacle conical, with short chaff. Achenia 4-sided. Pappus none, or a minute, 4-toothed margin. *Per.*

1. *R. laciniata.**Cone-flower.*

Stem smooth, round, branching; leaves often somewhat rough; lowest ones pinnate, with incised or 3-lobed leaflets; upper ones toothed and cut, petiolate, 3-5-lobed, with ovate-lanceolate, acuminate, and sometimes entire lobes; heads large, with linear, yellow, drooping rays, terminal. A tall plant, rather common in thickets and swamps, somewhat resembling a sun-flower. The highest leaves are simple and ovate. *July-Sep.*

18. ZINNIA.

Heads many-flowered. Rays 5, persistent, entire, pistillate. Disk-flowers perfect. Involucre-scales margined, imbricate. Receptacle chaffy, conical. Pappus of the disk-flowers consisting of 2 erect awns. *An.*

1. *Z. elegans.**Zinnia.*

Stem hairy, branching; leaves ovate, cordate, sessile and clasping, opposite, entire; heads large, on long peduncles; chaff serrated. A common annual in cultivation, with violet, purple, scarlet and white flowers.

2. *Z. multiflora.**Small Zinnia.*

Stem hairy; leaves ovate-lanceolate, on short petioles, opposite, entire; heads smaller than in the last, commonly purplish, on long peduncles. A common garden annual.

19. HELIANTHUS.

Heads many-flowered. Rays neutral. Disk-flowers perfect. Involucre-scales imbricated in several rows. Receptacle flat, or convex. Chaff persistent with the 4-sided, laterally compressed achenia. Pappus of 2 deciduous, chaffy awns. *Per. except No. 1.*

1. *H. annuus.**Sun-flower.*

Leaves cordate, petiolate, 3-veined, the lowest opposite the others, alternate; heads very large, on nodding or thickened peduncles; rays numerous, broad, bright yellow. A well-known cultivated annual species, with very large, cordate leaves and immense heads, sometimes 1 ft. in diameter. It grows 8-10 ft. high, and even higher, according to the soil. *July-Sep.*

2. *H. strumosus.**Wild Sun-flower.*

Stem erect, mostly simple, tall, smooth below; leaves opposite, ovate-lanceolate, serrate, acuminate, abrupt at base, rough above, smooth, or somewhat

pubescent and downy beneath, with short, winged petioles, heads rather large, few; rays about 10; involucre-scales ciliate, broadly lanceolate, equalling the lanceolate rays, with spreading tips. A common species with showy flowers 3-6 ft. high. River banks and low thickets. *Aug.-Sep.*

3. *H. decapetalus.**Ten-rayed Sun-flower.*

Stem tall, branching, rough above, smooth below; leaves opposite, ovate, acuminate, coarsely serrate, 3-veined, mostly somewhat rough above, of the same color on both sides, abrupt at base, with winged petioles; heads rather large, with about 10 pale yellow rays; involucre-scales linear-lanceolate, ciliate, spreading, outer ones longer than the disk. A less showy species than the last. Common along river banks, and in low thickets. Plants 2-5 ft. high, often with the outer involucre-scales more or less foliaceous. *Aug.-Sep.*

4. *H. divaricatus.**Slender Sun-flower.*

Stem smooth, simple, or sparingly branched; leaves opposite, ovate-lanceolate, 3-veined, sessile, rounded or truncate at base, acuminate, serrate, rough above; heads small, few, somewhat corymbose; involucre-scales lanceolate, acuminate, equalling the disk. A showy species 2-5 ft. high. Common in thickets and dry grounds. *Aug.-Sep.*

5. *H. tuberosus.**Jerusalem Artichoke.*

Stem rough, branching stout; leaves petiolate, 3-veined, acuminate, rough, serrate, ovate, alternate, lower ones opposite, cordate-ovate; petioles ciliate at base; rays 12-20; involucre-scales linear-lanceolate. A tall species with tuberous roots, naturalized around gardens and along fences. *Sep.*

20. TAGÈTES.

Heads heterogamous; involucre tubular, of 5 united scales in 1 row. Ray-flowers 5, persistent. Receptacle naked. Pappus of 5 erect bristles. *An.*

1. *T. patula.**French Marigold.*

Stem erect, with spreading branches; leaves pinnately divided; segments linear-lanceolate; heads orange-yellow, solitary, on long, cylindrical peduncles; involucre smooth. A garden annual, about 2 feet high.

2. *T. erecta.**African Marigold.*

Stem erect; leaves pinnately divided, segments lanceolate, ciliate, serrate; heads twice larger than *T. patula*, solitary on the thickened and ventricose peduncles. Garden annual.

21. HELÈNIUM.

Heads many-flowered. Rays pistillate. Involucre in 2 rows. Pappus of several 5-awned chaffy scales. Receptacle globose, naked. Rays 3-cleft at summit. *Per.*

1. *H. autumnale.**Sneeze-weed.*

Nearly smooth; stem erect, branching, with winged angles; leaves alternate, lanceolate, serrate, decurrent; heads numerous, terminal on the stem and branches, loosely corymbose, showy; rays drooping, longer than the globular disk, obtusely 3-toothed at apex. A showy plant, 2-3 ft. high, very bitter to the taste. Common in low grounds, along rivers in New York; rare in New England. *Sep.*

22. ANTHEMIS.

Heads many-flowered. Rays pistillate. Involucre hemispherical, with the scales imbricate and nearly equal. Receptacle chaffy, conical. Pappus none, or forming a minute crown on the obovoid achenium.

1. *A. nobilis.**Chamomile.*

Stem prostrate, branching at base, woolly; leaves pinnatifidly decomposed; segments linear-subulate; heads white, fragrant; chaff scarious, lanceolate, rather shorter than the flowers. A common plant in gardens, cultivated for its fragrance and medicinal properties. *July-Sep.*

23. MARÛTA.

Heads many-flowered. Rays neutral. Involucre imbricated, hemispherical. Receptacle chaffy, conical. Pappus none. Achenia obovoid, smooth. *An.*

1. *M. cótula.**May-weed.*

Stem erect, furrowed, very branching, nearly smooth; leaves alternate, bipinnatifid; segments linear-subulate; heads solitary, on long, furrowed peduncles; rays white, deflexed; disk yellow; involucre-scales scarious on the margin; chaff bristly, shorter than the flowers, found only on the summit of the

receptacle. An ill-scented plant, 1 ft. high, with dark-green, very finely dissected leaves. Naturalized, and common in road-sides and waste places. *June. Sep.*

24. ACHILLÆA.

Heads many-flowered. Rays 5—10, pistillate. Involucre with imbricate, unequal scales. Receptacle flat, chaffy. Pappus none. *Per.*

1. *A. millefolium.**Yarrow.*

Stem erect, furrowed, branching above; leaves alternate, bi-pinnately divided, segments linear, toothed or lobed, mucronate; heads small, numerous, in dense, flat, terminal corymbs; rays about 5, short, white (sometimes rose-color); involucre furrowed, oblong. A common plant, with a pungent and somewhat agreeable odor; 1 ft. high; in fields and pastures. *June—Aug.*

25. LEUCANTHEMUM.

Heads many-flowered. Rays numerous, pistillate. Involucre depressed, flattish; scales imbricate with scarious margins. Receptacle naked, flat. Achenia striate. Pappus none. *Per.*

1. *L. vulgare.**Ox-eye Daisy.*

Stem erect, simple, or sparingly branched, furrowed. Leaves few and rather small, cut-pinnatifid, incised at base; radical ones spatulate, petiolate; upper ones lanceolate, more or less clasping at base; heads large, solitary, on long, naked, furrowed peduncles; rays white; disk yellow; involucre-scales with brownish margins. A common and troublesome weed with showy heads. Introduced. *July—Sep.*

26. PYRÆTHRUM.

Heads many-flowered. Involucre hemispherical. Scales imbricate, with membranous margins. Receptacle naked. Pappus reduced to a membranous border, crowning the achenia. *Per.*

1. *P. parthénium.**Feverfew.*

Stem erect, branching; leaves alternate, petiolate, tri-pinnately divided; segments ovate, incised; heads numerous, corymbosely arranged; involucre pubescent. Common in cultivation, and admired for its pure white flowers, which last for some time; often double.

27. CHRYSANTHEMUM.

Heads many-flowered. Involucre hemispherical. Scales imbricate, with membranous margins. Receptacle naked. Pappus none. *Per.*

1. *C. coronarium. Grecian Chrysanthemum.*

Stem erect, smooth, branching; leaves alternate, bi-pinnatifid, clasping, acute, broadest near the summit; heads large, terminal, solitary. A garden annual. Flowers double in cultivation. *Aug.*

2. *C. carinatum. Three-colored Chrysanthemum.*

Stem erect, branching; leaves bi-pinnate, fleshy, smooth; heads large, showy; disk purple; rays white, yellow at base, or entirely yellow; involucre-scales carinate. A garden annual. *July—Oct.*

3. *C. sinense. Chinese Chrysanthemum.*

Stem erect, branching; leaves sinuate-pinnatifid, toothed, coriaceous, glaucous, petiolate; rays very long, and of lilac, yellow, purple and reddish brown, to a pure and vivid white. A beautiful plant, cultivated in pots, and in sheltered places in the open air. The varieties are almost endless.

28. COREÓPSIS.

Heads many-flowered. Rays about 8; neutral. Involucre double. Each series 6—10 leaved. Receptacle flat and chaffy. Achenia compressed, emarginate, 2-awned.

1. *C. tinctoria.**Coreopsis.*

Smooth; stem erect, branching; radical leaves somewhat bi-pinnate, segments oval, entire; cauline ones somewhat pinnate, with linear segments; heads large, numerous, brilliant; rays bright yellow, brownish purple at base; achenia smooth. A beautiful garden annual, 1—3 ft. high. Very common in cultivation, with elegant foliage, and numerous very brilliant flowers. *All summer.*

29. BIDENS.

Heads many-flowered. Rays neutral, sometimes inconspicuous, or wanting. Involucre double. Outer series large and

foliaceous. Receptacle chaffy, flat. Achenia compressed, slender and 4-sided, armed with 2—4 rigid, persistent awns, which are rough backwards. *An.*

1. *B. frondosa.**Beggar Ticks.*

Smooth, or slightly pubescent; stem erect, tall, with spreading branches, leaves pinnately 3—5-parted, segments lanceolate, acuminate, serrate, mostly petiolate; leaflets of the outer involucre much longer than the flower, ciliate at base; heads discoid; achenia flat, cuneate-obovate, 2-awned, with rough margins. A common and extremely troublesome weed, in moist, cultivated grounds, and waste places; the achenia when mature clinging by their awns to every thing that passes them. *July—Sep. An.*

2. *B. connata.**Burr-Marigold.*

Stem erect, with 4 furrows and opposite branches; leaves lanceolate, opposite, acuminate, sharply serrate, tapering into margined, somewhat connate petioles; lower ones often 3-parted, with the lateral segments decurrent; heads solitary, discoid; outer scales of the involucre foliaceous, longer than the flower; achenia flat, narrowly cuneate, with awns. A common species, 1—2 ft. high, in wet grounds. *Aug.—Sep. An.*

3. *B. cernua.**Nodding Burr-Marigold.*

Mostly smooth; stem terete, with the branches opposite; leaves lanceolate, unequally serrate, slightly connate; heads nodding, discoid, or with a few, short, yellow rays; leaflets of the outer involucre longer than the head; achenia wedge-obovate, armed with 4 awns. A common species, 1—2 ft. high, growing in swamps and ditches. *Aug.—Sept. An.*

4. *B. chrysanthemoides.**Large-flowered Burr Marigold.*

Smooth; stem erect, or decumbent; leaves lanceolate, attenuate at each end, connate at base, with regular and even serratures; heads erect, or nodding, radiate; rays large, conspicuous, bright yellow; leaflets of the outer involucre mostly shorter than the rays; achenia cuneate with 2—4 awns. A common and showy plant, growing 6'—18', in swamps and ditches. *Sept.—Oct. An.*

30. SENECIO.

Heads many-flowered, either discoid, with tubular, perfect flowers, or radiate, with pistillate rays. Involucre-scales mostly in a single row. Receptacle flat, naked. Pappus simple, capillary, copious. *Leaves alternate.*

1. *S. vulgaris.**Common Groundsel.*

Stem erect, branching, angular, mostly smooth; leaves pinnatifid, toothed, clasping; radical ones petiolate; heads discoid, terminal, yellow, in loose corymbs, nodding. A common weed in waste grounds, 15' high, blooming the whole season. *An.*

2. *S. aureus.**Golden Senecio.*

Mostly smooth; stem furrowed, erect, nearly simple; radical leaves undivided and roundish, mostly cordate, crenate, on long petioles; lower cauline ones lyrate; upper lanceolate, pinnatifid, sessile or somewhat clasping; heads large, showy, with golden-yellow rays, somewhat umbellate, in flat, terminal corymbs; involucre-scales linear, acute. A very handsome and variable plant, 10'—20' high; common in meadows and damp thickets.

The most marked varieties are—1. *obovata*, radical leaves orbicular-obovate; found in drier grounds than the common form. 2. *Balsamita*, radical leaves oblong or lanceolate, tapering at base to a petiole. In rocky places. *May—June. Per.*

31. ARTEMISIA.

Heads discoid, few, or many-flowered. Flowers all tubular; marginal ones usually pistillate, sometimes perfect; the rest perfect. Involucre-scales imbricate, dry and scarious on the margins. Receptacle flat, naked, or slightly hairy. Achenia with a small disk at summit. Pappus none.

1. *A. caudata.**Slender-leaved Wormwood.*

Smooth; stem straight, herbaceous; radical and lower leaves bi- or tripinnately-parted; upper ones pinnately-parted; segments filiform, alternate; heads small, subglobose, pedicellate, erect, racemose, in a long, terminal panicle; outer scales of the involucre ovate, inner ones oval. Stem 2—5 ft. high. Common near the sea-coast, from N. H. southward. *Sept. Bien.*

2. *A. Abrotanum.**Southernwood.*

Stem erect, shrubby; lower leaves bipinnately-parted; upper ones pinnate

ly-parted; segments very narrowly linear, capillary; heads numerous, small, yellowish, nodding; involucre downy, hemispherical. A common shrub, 3–4 ft. high, cultivated in gardens.

3. *A. vulgâris*.

Mugwort.

Stem erect, with whitish-tomentose branches; leaves whitish-tomentose beneath; cauline ones pinnatifid, with linear-lanceolate, entire, or incised lobes; heads few, erect, nearly sessile, purplish, racemose, forming a loose, leafy, terminal panicle; involucre tomentose. Plant, 2–3 ft. high. Naturalized and common along road-sides and in waste places in N. and E. N. Eng. *July–Aug. Per.*

4. *A. Absinthium*.

Wormwood.

Stem erect, furrowed, very branching, somewhat shrubby, covered with white, silky down; leaves bi- or tripinnately-parted, clothed with whitish, soft down; segments lanceolate, obtuse, often incised; heads very numerous, yellowish, nodding, racemose on the branches, forming a large, leafy panicle. An herb, distinguished by its bitter and aromatic smell and taste, often cultivated in gardens, and frequently naturalized along road-sides. Stem 1–2 ft. high. *Aug. Per.*

32. TANACETUM.

Heads many-flowered, nearly discoid; marginal ones pistillate, 3–5-toothed. Involucre hemispherical, with minute, imbricated scales. Receptacle convex, naked. Achenia with a large flat top. Pappus forming a short, membranaceous crown. *Per.*

1. *T. vulgare*.

Tansy.

Stem erect, furrowed, branching above, smooth; leaves bipinnately-parted; segments incised; heads yellow, in flat, terminal corymbs; pappus 5-lobed. A common naturalized plant, growing in bunches in old fields and along road-sides. Stem 2–3 feet high. The plant has a strong, rather agreeable, aromatic smell and a very bitter taste. What is called *double tansy*, is merely a variety with more extensively cut and crisped leaves. *Aug.*

33. GNAPHALIUM.

Heads many-flowered, discoid; outer flowers pistillate and slender; central ones perfect. Involucre-scales imbricate, scarious, white or colored. Receptacle flat, naked. Pappus simple, rough, capillary.

1. *G. polycéphalum*.

Life Everlasting.

Stem erect, branching, covered with cottony down; leaves linear-lanceolate, tapering at base, sessile, white-downy beneath, nearly smooth above; heads in dense clusters at the summit of the branches, paniculately corymbose, fragrant; involucre-scales ovate, or ovate-lanceolate, acute, whitish; flowers yellowish. A common plant, in fields and old pastures, distinguished by its fragrance. Stem 1–2 ft. high. *Aug.–Sept. Per.*

2. *G. decurrens*. *Decurrent Life Everlasting.*

Stem erect, stout, branched above, viscidly pubescent, with white-downy, spreading branches; leaves linear-lanceolate, very acute, decurrent, naked above, woolly beneath; heads in dense, terminal, corymbose clusters; involucre-scales oval, acutish. A stout species, 1–2 ft. high, in hilly pastures, distinguished by its decurrent leaves and want of fragrance. Not uncommon. *Aug.–Sept. Per.*

3. *G. uliginosum*.

Cud-weed.

Woolly; stem low, diffusely branched; leaves lanceolate or linear; heads small, in sessile, terminal, crowded, leafy clusters; involucre-scales oblong, yellowish. A low and spreading species, 3'–6' high, very common in low grounds and along road-sides. *Aug.–Sept. An.*

34. ANTENNARIA.

Heads many-flowered, dioecious; pistillate heads with filiform corollas. Involucre-scales imbricate, scarious, white or colored. Receptacle more or less convex, not chaffy. Pappus simple, bristly; that of the fertile flowers capillary, that of the sterile flowers thickened at summit. *Per.*

1. *A. margaritacea*.

Pearl Everlasting.

Stem erect, leafy, white-downy, corymbose above; leaves linear-lanceolate, acuminate, sessile, covered with white down, 3-veined; heads in a terminal, flat corymb; involucre-scales elliptic, obtuse, pearly-white; flowers yellowish. A common plant, in fields and pastures, covered with whitish down, and especially remarkable for the unfading, pearly scales of the involucre. Stem 1–2 ft. high. *Aug.*

2. *A. plantaginifolia*. *Mouse-ear Everlasting.*

Stoloniferous; stem simple, downy; leaves white and silky when young, at length green above and hoary beneath; radical ones obovate, or spatulate, on short petioles; cauline smaller, lanceolate, appressed to the scape-like stem; heads small, aggregate in a dense, terminal corymb; involucre-scales mostly white; outer ones more or less obtuse. A very common, early-flowering plant, 3'–6' high, in old fields and pastures, where it propagates by means of procumbent shoots or stolons. *April–July.*

35. ERÉCHTILIS.

Heads discoid, many-flowered; flowers tubular; those of the margin pistillate, those of the centre perfect. Involucre cylindrical, with linear, acute scales, in a single row. Receptacle naked. Pappus abundant, of very soft, capillary bristles. *An.*

1. *E. hieracifolia*.

Fire-weed.

Stem thick, fleshy, paniculately branching above; leaves alternate, oblong or lanceolate, sessile and often clasping, unequally and sharply incised; heads whitish, crowded; involucre smooth. A common, coarse weed, in fields, and especially in newly cleared grounds. Stem 2–4 ft. high. *Aug.–Sept.*

36. XANTHIUM.

Sterile and fertile flowers in different heads upon the same plant. Sterile involucre imbricate, with several funnel-form staminate flowers; receptacle chaffy. Fertile involucre closed, 2-leaved, covered with hooked prickles, 2-flowered. *An.*

1. *X. Strumarium*.

Clot-weed.

Stem erect, unarmed, branching; leaves cordate, 3–5-lobed, dentate, rough; fruit oval, subpubescent, with 2 straight beaks. A coarse plant, with large and very rough leaves, not uncommon in fields and waste places. Introduced. Stem 2–4 ft. high. *Aug.–Sept.*

37. AMBRÓSIA.

Sterile and fertile flowers in different heads upon the same plant. Sterile involucre hemispherical, composed of united scales. Staminate flowers 5 or more, funnel-form. Fertile involucre 1-leaved, closed, 1-flowered. *An.*

1. *A. trifida*.

Great Rag-weed.

Hairy, rough; stem tall, square, stout, usually branching; leaves large, opposite, usually 3-lobed, sometimes ovate or oval, acuminate, serrate; sterile flowers in long, naked, axillary, or terminal racemes; fertile flowers sessile below, in the axils of the upper leaves, each with a 6-ribbed involucre, terminating in 6 tubercles. A tall, rank, herbaceous plant, usually with very large leaves, found in low grounds along the Connecticut, and thence westward and southward. Stem 4–12 ft. high. *Aug.*

2. *A. artemisiæfolia*.

Roman Wormwood.

Stem erect, slender, branching, more or less hairy; leaves bipinnatifid, nearly smooth above, more or less hoary beneath; lower ones opposite, upper ones alternate; sterile racemes naked, terminal, loosely panicled; fertile flowers sessile in the axils of the upper leaves. A very common, homely and exceedingly troublesome weed, in cultivated grounds. Stem 2–4 ft. high. *Aug.–Sept.*

38. IVA.

Heads discoid; marginal flowers 1–5, pistillate, with a tubular corolla; the rest staminate, with a funnel-form 5-toothed corolla. Involucre-scales few, mostly in 1 row. Receptacle hairy. Achenia obovoid, obtuse. Pappus none.

1. *I. frutescens*. *Marsh Elder. Highwater Shrub.*

Nearly or quite smooth; stem shrubby, with opposite branches; leaves oval or lanceolate, coarsely serrate, with 3 prominent veins, petiolate, the lower ones opposite, the upper alternate, narrow; heads greenish-white, on short, recurved pedicels, in long, axillary racemes, arranged in a long, leafy, terminal panicle. A common, fleshy, and shrubby plant, 3–6 ft. high, growing along the seashore, and on the borders of salt marshes, just above highwater mark. *Aug.*

39. CALÉNDULA.

Heads many-flowered, radiate. Involucre-scales many, equal, in about 2 rows. Receptacle naked. Achenia of the disk naked. Pappus none. *An.*

1. *C. officinalis*.*Pot-Marigold.*

Viscid-pubescent; stem erect, branching; leaves oblong, acute, mucronate, sessile, somewhat toothed, ciliate, scabrous on the margin; heads few, large, terminal, solitary. A handsome annual, common in gardens, generally with orange-colored, often double flowers.

40. CENTAUREA.

Heads many-flowered. Flowers all tubular; marginal ones mostly enlarged and sterile, resembling ray-flowers. Involucre imbricate. Receptacle bristly. *An.*

1. *C. Cyanus*.*Bachelor's Button.*

Stem erect, branching, downy; leaves linear, sessile, downy; heads solitary, ovoid; sterile flowers longer than the disk; involucre-scales fringed. A common garden annual, sometimes naturalized along road-sides, generally with light blue flowers, but varying to purplish, or white. *July.*

41. AMBÉRBOA.

Heads discoid. Marginal flowers usually enlarged and sterile. Involucre-scales imbricate. Pappus of oblong, or obovate scales, sometimes small or none. *An.*

1. *A. moschata*.*Sweet Sultan.*

Lower leaves lyrate toothed; involucre subglobose, smooth, with ovate scales; marginal flowers scarcely longer than the rest, not exceeding the disk; heads purple, sometimes white. Gardens. *July—Oct.*

2. *A. odorata*.*Yellow Sweet Sultan.*

Lower leaves somewhat broadly spatulate; upper ones lyrate at base; marginal flowers enlarged, longer than the disk; pappus chaffy, a little shorter than the achenia; heads yellow. A garden annual, sometimes varying to purple flowers, and deeply pinnatifid leaves. *July—Oct.*

42. CARTHAMUS.

Heads discoid. Flowers all tubular and perfect. Involucre of imbricated scales; outer ones foliaceous. Receptacle with setaceous chaff. Pappus none. Achenia 4-sided. *An.*

1. *C. tinctorius*.*Common Safron.*

Stem smooth, oval, striate, branching; leaves ovate-lanceolate, sessile, denticulate, with spinose teeth, somewhat clasping, smooth and shining; heads large, terminating the branches, orange-colored, with the numerous flowers long and filiform. A common plant in gardens, sometimes used for dyeing. Stem 1—2 ft. high. *July.*

43. XERANTHEMUM.

Heads discoid. Involucre hemispherical, with colored, opaque, scarious scales, resembling rays. Receptacle chaffy. Pappus chaffy and setaceous. *An.*

1. *X. annuum*.

Stem erect, branching; leaves alternate, oblong-lanceolate, more or less obtuse, entire; heads large, terminal, solitary; involucre-scales, obtuse; inner ones radiant, spreading, lanceolate, obtuse. A very elegant garden annual, with large, spreading involucre-scales, generally purple, but often of other colors, resembling ray-flowers. The heads retain their beauty through the winter.

44. ONOPORDON.

Heads discoid. Flowers all tubular, perfect. Involucre ventricose, with coriaceous, imbricate, spreading, spinous scales. Receptacle deeply alveolate. Pappus copious, capillary, united at base into a ring. Achenia 4-angled. *Bien.*

1. *O. Acanthium*.*Cotton Thistle.*

Woolly; leaves oblong-ovate, decurrent, toothed, spinous; heads large, purple, solitary; involucre globose, white-downy, with spreading, linear-subulate scales. A fine thistle, 2—5 ft. high, covered throughout with cottony down. Naturalized and common along road-sides. *July.*

45. CIRSIUM.

Heads discoid, many-flowered. Flowers all perfect. Involucre-scales usually tipped with spines, imbricated in many rows. Receptacle bristly. Pappus of capillary, plumose bristles united in a ring at base. Achenia oblong, compressed, smooth. *Bien. except No. 1.*

1. *C. arvense*.*Canada Thistle.*

Root creeping; stem erect, branching; leaves pinnatifid, with spiny teeth, smooth or somewhat downy beneath; heads small, light purple, numerous, in a terminal, loose panicle; involucre-scales closely appressed, tipped with minute spines. A very common and exceedingly troublesome weed, spreading rapidly, by its creeping roots, over fields and meadows, and rendering them unproductive. Stem 2—3 ft. high. Introduced. *July.*

2. *C. discolor*.*Tall Thistle.*

Stem furrowed, hairy, leafy, branching; leaves pinnatifid, slightly hairy above, covered with white wool beneath; lobes divaricate, 2—3-cleft, the segments tipped with spines; heads rather large, pale purple, solitary; involucre-scales appressed, tipped with spines. A tall thistle, 3—7 ft. high, not uncommon in thickets and meadows. *Aug.*

3. *C. mucum*.*Glutinous Thistle.*

Stem tall, slender, nearly or quite smooth, branching; leaves pinnatifid, slightly hairy above, covered with thin white hairs beneath when young; lobes divaricate, lanceolate, acute, incised, the tips armed with spines; heads rather large, solitary, or nearly so, on the nearly naked branches; involucre-scales ovate, unarmed, sometimes mucronate, webbed and glutinous at base. A tall thistle, 3—7 ft. high, common in swamps and low grounds. *Aug.—Sep.*

4. *C. lanceolatum*.*Common Thistle.*

Stem very branching, leafy; leaves deeply pinnatifid, decurrent, hispid above, white and woolly beneath, with divaricate, spinescent segments; heads large, numerous, purple; involucre-scales spreading, lanceolate, tipped with long and formidable spines. A very prickly thistle, 3—5 ft. high, common along road-sides and in waste places. Introduced. *July—Sep.*

5. *C. pumilum*.*Pasture Thistle.*

Stem very stont, hairy, nearly or quite simple; leaves pinnatifid, clasping at base, green on both sides; segments variously lobed and cut, ciliate, spinose; heads very large, 1'—3' in diameter, fragrant, about 1—8 in number, purple, rarely whitish; involucre-scales spinous. A very common thistle, 1—2 ft. high, distinguished by its very large fragrant heads, growing in pastures and fields. *Aug.*

46. LAPPULA.

Heads discoid, many-flowered. Flowers all perfect. Involucre globose, with appressed, imbricated scales, each tipped with a subulate, hooked appendage. Receptacle bristly. Pappus bristly, rough, deciduous. Achenia oblong, compressed. *Per.*

1. *L. major*.*Burdock.*

Stem low, stont, very branching; radical leaves very large, cordate, on long channelled, fleshy, petioles; upper leaves ovate, much smaller; all more or less woolly beneath, and undulate on the margin; heads small, mostly in dense clusters; corollas tubular, pink-colored, quite pretty; involucre-scales ending in a long, firm bristle, with a hook at the end. A very common weed in waste grounds, distinguished by its large root-leaves, as well as by the hooked involucre-scales, which attach themselves to every thing that passes. *July—Aug.*

47. CICHORIUM.

Heads many-flowered. Involucre double; outer of 5 short, leafy scales; the inner of 8—10. Receptacle chaffy. Pappus short, chaffy. Achenia striate. *Per.*

1. *C. intybus*.*Succory.*

Stem terete, with several long, nearly simple branches; lower leaves renunciate; upper ones oblong or lanceolate, more or less clasping at base, slightly dentate or entire, small and inconspicuous; heads 2—3 together, axillary, sessile, light blue, showy; corolla 5-toothed. A handsome plant, 2—3 feet high, naturalized in fields and road-sides, not uncommon in districts near the coast. *July—Sep.*

48. KRIGIA.

Heads 8—20-flowered. Involucre-scales equal, in about 2 rows. Receptacle naked. Pappus double; the outer of 5 broad scales; the inner of 5 bristles alternating with the exterior scales. Achenia obovate. *An.*

1. *K. Virginica*.*Dwarf Dandelion.*

Acanthoid; leaves lanceolate, or narrowly spatulate, often pinnatifid or lyrate, smooth, the early ones roundish, entire; scapes several, slender, 1-flowered, rarely forked, elongated after flowering; heads small, yellow; involucre

smooth. A pretty little plant with slender scapes, 1'—6' high. Common in dry soils. *May—July*.

49. LEONTODON.

Heads many-flowered. Involucre scarcely imbricated, with several small scales at base. Receptacle naked. Pappus plumose, persistent. Achenia striate, somewhat rostrate. *Per*.

1. *L. autumnalis*. *Autumn Dandelion*.

Acaulescent; scape smooth, branching; leaves radical, lanceolate, pinnatifid; peduncles scaly, thickened upwards; heads yellow, on separate peduncles, resembling somewhat those of the dandelion. Naturalized in E. N. Eng., and common in fields and road-sides. Scape 6'—15' high, bearing several heads. *July—Nov*.

50. TRAGOPOGON.

Heads many-flowered. Involucre with numerous scales in a single row. Receptacle naked. Pappus plumose. Achenia striate, with a long filiform beak. *Bien*.

1. *T. porrifolius*. *Salsify*. *Vegetable Oyster*.

Leaves long, linear, entire; heads terminal, solitary, large, bluish-purple, on peduncles thickened above; involucre-scales much longer than the corollas. A garden vegetable, with showy flowers, chiefly cultivated for the root, which is in some esteem as an esculent. Stem 1—2 ft. high. *July—Aug*.

51. LACTUCA.

Heads several-flowered. Involucre-scales in 2 or more rows. Pappus copious, fugacious, soft and capillary. Achenia compressed, with long, filiform beaks.

1. *L. elongata*. *Wild Lettuce*.

Stem tall, stout, usually leafy, branching above; leaves smooth, paler beneath; lower ones clasping, runcinate; upper ones lanceolate, entire, sessile; heads small, numerous, racemose on the branches, forming a long, naked panicle; corolla yellow, rarely purple; achenia oval, about as long as the beak. A very variable plant, abounding in a milky juice, 2—6 ft. high, common in rich, moist soils. The most marked varieties are var. 1, *Integrifolia*, which has the leaves mostly entire, and var. 2, *sanguinea*, with a more slender, less leafy, and often purple stem, and the leaves all clasping, and runcinate, glaucous beneath. *Bien*.

2. *L. sativa*. *Garden Lettuce*.

Stem smooth, branching, corymbose above; leaves more or less orbicular, very smooth; corolla ones cordate; heads numerous, small, yellow, in terminal corymbs. A common garden annual with a milky juice, universally cultivated for salad. *June—July*.

52. MULGEDIUM.

Heads many-flowered. Involucre-scales in 2 or more rows; outer series short, imbricated; achenia compressed, striate, with a short, thick beak. Pappus soft, capillary, copious, crowning the achenium. *Bien*.

1. *M. leucophæum*. *Blue Lettuce*.

Stem tall, branching above, very leafy; leaves pinnatifid, or runcinate, coarsely toothed; uppermost sessile, often undivided; heads small, numerous, pale blue, on bracteate and scaly peduncles, forming a long, terminal panicle; pappus tawny. A tall plant, with a milky juice, resembling a *Lactuca*, but distinguished by its bluish corollas. Stem 3—10 ft. high. Common in low grounds and thickets. *Aug.—Sep*.

53. HIERACIUM.

Heads many-flowered. Involucre-scales usually more or less imbricate. Achenia striate, oblong, more or less rostrate. Pappus of tawny, fragile, capillary bristles, in a single row. *Flowers yellow*. *Per*.

1. *H. Canadense*. *Canadian Hawkweed*.

Stem leafy, somewhat pubescent; leaves lanceolate, or oblong-ovate, acute, dentate with coarse and acute teeth, sessile; upper ones somewhat clasping; heads large, on hairy peduncles, forming a terminal, paniculate corymb; involucre-scales linear, imbricated. A stout species, with showy flowers, not uncommon in dry woods. Stem 1—2 ft. high. *Aug*.

2. *H. venosum*. *Veiny Hawkweed*.

Mostly acaulescent; stem or scape slender, smooth, often with 1 or 2 leaves, branching, loosely corymbose above; radical leaves obovate, sometimes oblong,

nearly entire, on very short petioles, hairy above, nearly smooth and glaucous beneath, ciliate, marked with purplish veins; peduncles slender; heads rather small, solitary, bright yellow. A common species in dry woods, distinguished by its purple-veined leaves. Scape or stem 1—2 ft. high, rarely leafy at base. *July—Aug*.

3. *H. Gronovii*. *Hairy Hawkweed*.

Stem erect, virgate, mostly simple, leafy and hairy below, nearly naked above; leaves obovate, or oblong, entire, ciliate, hairy, especially on the mid-vein beneath; heads on glandular, rather short pedicels, arranged in a long, oblong panicle; involucre somewhat glandular; achenia enlarged upwards, almost rostrate. A very hairy species, 1—3 ft. high, not uncommon in dry soils. *Aug*.

4. *H. scabrum*. *Rough Hawkweed*.

Stem leafy, nearly simple, rough, hairy; leaves hairy, nearly entire; lower ones obovate, slightly petiolate, upper ones oval, sessile; peduncle thick, glandular-hispid; heads 40—50 flowered, at first in a racemose, but finally somewhat corymbose panicle; involucre densely glandular-hispid. A rough species, 15'—24' high, common in dry soils.

5. *H. paniculatum*. *Slender Hawkweed*.

Stem slender, with spreading branches, leafy, covered with whitish hairs below; leaves lanceolate or oblong-lanceolate, tapering at both ends, smooth, thin, denticulate; heads very small, on long, slender peduncles, forming a loose panicle. A slender and comparatively delicate species, 1—3 ft. high, common in damp woods and thickets. *Aug*.

6. *H. aurantiacum*. *Golden Hawkweed*.

Stem leafy, hispid; leaves oblong, somewhat acute, pilose, hispid; heads large, orange-colored, in dense corymbs. A garden species.

54. NABALUS.

Involucre cylindrical, with 5—10 linear scales in one row, and a few, short, appressed scales at base. Receptacle naked. Pappus-bristles copious, capillary, brownish, or straw-color, in two series. Achenia striate, linear-oblong, without beaks. *Per*.

1. *N. albus*. *White Lettuce*.

Stem tall, smooth, somewhat glaucous, corymbosely paniculate above; leaves angular-hastate, often 3—5-lobed; upper ones ovate, dentate, or oblong, entire; involucre purplish, consisting of about 8 scales; heads 8—12-flowered in axillary and terminal, nodding racemes; pappus brownish. A stout plant, 2—4 ft. high, with very variable, often deeply lobed leaves, common in woods. *Aug*.

2. *N. altissimus*. *Tall White Lettuce*.

Smooth; stem slender, tall; leaves triangular-ovate, cordate, petiolate, variously lobed and toothed, or else nearly entire; petioles naked or margined; involucre of 5 greenish scales; heads nodding, 5—6-flowered in axillary and terminal racemes, forming a long, leafy, virgate panicle; pappus of a dirty white or pale straw-color. A tall species, 3—6 ft. high, with exceedingly variable leaves, common in woods. *Aug*.

55. TARAXACUM.

Heads many-flowered. Involucre double; outer series of short scales; inner of linear, appressed ones. Receptacle naked. Achenia oblong, with a long, filiform beak, crowned with the white, copious, capillary pappus. *Per*.

1. *T. Dens-Leonis*. *Dandelion*.

Acaulescent; smooth or nearly so; scapes several, hollow, naked, 1-flowered; leaves runcinately toothed; heads large, erect, yellow; outer involucre reflexed. A very common plant in fields and pastures, with a tuft of radical leaves, from which arise several scapes, which elongate after flowering; the inner involucre, at first closed, is reflexed, and the achenia with their long beaks, supporting an abundant pappus, form a white, globular head. *April—Oct*.

56. SÓNCHUS.

Heads many-flowered, at length tumid at base. Involucre-scales imbricate, unequal. Receptacle naked. Pappus-bristles copious, white, very soft and capillary, in several series. Achenia compressed, without beaks. *Per*.

1. *S. oleraceus*. *Sow-Thistle*.

Smooth and glaucous; leaves runcinate, or sometimes nearly entire,

slightly dentate, the teeth tipped with weak spines, cordate and clasping at base, with acute auricles; heads rather few, paniculate, yellow; peduncles downy; involucre downy when young. A weed-like plant, 2–3 ft. high, common in waste places, in the neighborhood of the sea-coast. *Sep.*

2. *S. áser.**Rough Sow-Thistle.*

Stem branching above; leaves clasping, cordate at base, with rounded auricles, oblong-lanceolate, undulate or slightly runcinate, toothed and spinose; peduncles and summit of the branches clothed with stiff glandular hairs; heads small, yellow. A more rigid and spiny plant than the last. Common in waste places. Stem 3–4 ft. high. *Aug.—Sep.*

ORDER LXV. Lobeliaceæ.—*Lobelia-family.*

1. LOBELIA.

Calyx 5-cleft, with a short tube. Corolla tubular, irregular, deeply cleft on the upper side; limb somewhat 2-lipped; upper lip nearly erect, 2-cleft; lower lip spreading, 3-cleft. Capsule 2-celled, opening at summit. Seeds minute, many. *Per. except No. 2.*

1. *L. cardinalis.**Cardinal Flower.*

Stem erect, simple; leaves ovate-lanceolate, acute, or acuminate, serrate; flowers deep scarlet, large, in a long, terminal secund, bracted raceme; bracts linear, leaflike; pedicels short; corolla much longer than the calyx. A splendid plant, common in low grounds, distinguished by its large, brilliant flowers which are sometimes white. Stem 2–3 ft. high. *July—Sep.*

2. *L. inflata.**Indian Tobacco.*

Stem erect, branching, pubescent; leaves sessile, ovate-lanceolate, serrate, pubescent; flowers small, pale blue, axillary, pedicellate, in leafy spikes; bracts ovate-lanceolate, acuminate, longer than the pedicels; calyx-teeth as long as the corolla; capsule inflated. A common plant, 1–2 ft. high, possessing very active properties, which render it a powerful medicine and a virulent poison. Fields and pastures. *July—Sept. An. or Bien.*

3. *L. Dortmanna.**Water Lobelia.*

Smooth; scape simple, naked; leaves radical, linear, terete, fleshy, obtuse, in a tuft at the base of the scape; flowers pale blue, remote, nodding, forming a terminal raceme; bracts ovate, much shorter than the pedicels. A curious species, growing in ponds, with a tuft of leaves at bottom, and a few remote flowers just out of water. Not uncommon. *July.*

4. *L. spicata.**Slender Lobelia.*

Slightly pubescent; stem erect, simple, slender; radical leaves oblong, or spatulate; cauline oblong-lanceolate or lanceolate; all but the uppermost dentate; flowers small, pale blue, in long, spicate racemes; bracts narrow-linear, nearly as long as the pedicels; calyx-teeth as long as the corolla, subulate. A slender species, 1–2 ft. high. Common in fields. *July—Aug.*

ORDER LXVI. Campanulaceæ.—*Bellflower-family.*

1. CAMPANULA.

Calyx 5-cleft. Corolla mostly campanulate, 5-lobed. Stamens 5, broad at base. Stigmas 3–5. Capsule 3–5-celled, opening laterally by pores.

1. *C. rotundifolia.**Hairbell.*

Stem slender, branching, weak; radical leaves ovate, or roundish, cordate, crenate, on long petioles, soon withering and disappearing; cauline narrow-linear, entire, smooth; flowers bright blue, nodding; corolla twice as long as the subulate calyx-teeth. A very delicate and elegant plant, about a foot high, growing on the rocky banks of streams, most common in Northern N. Eng. and N. York. The root-leaves wither just before flowering, and hence are rarely observed. *July—Sept. Per.*

2. *C. aparinoides.**Prickly Bell-flower.*

Stem slender, weak, branching, 3-angled, the angles rough backwards; leaves linear-lanceolate, denticulate, rough backwards on the margin and veins; flowers small, nearly white, solitary, on slender, diverging peduncles; corolla campanulate, much longer than the triangular calyx-teeth. A very slender plant,

common in meadows and low grounds, where it supports itself upon other plants, by means of its prickly stem and leaves. *June—Aug. An.*

3. *C. Americana.**American Bell-flower.*

Stem erect, virgate, nearly simple; leaves ovate-lanceolate, tapering at both ends, serrate, slightly hairy, with ciliate petioles; the lowest sometimes cordate; flowers large, blue, nearly rotate, deeply cleft, axillary, sessile, solitary, or several together; calyx-teeth subulate, shorter than the corolla. An elegant species 2–3 ft. high, native in N. Y. and Penn. Not uncommon in cultivation. *July—Aug.*

4. *C. glomerata.**Clustered Bell-flower.*

Stem angular, smooth, simple; leaves oblong-lanceolate, cordate at base, sessile, rough; lowest petiolate; flowers large, mostly deep blue, aggregated in a dense cluster; corolla almost funnel-form, twice as long as the acuminate calyx-teeth. A handsome species, frequent in gardens, where there are many varieties. Stem 2–4 ft. high. *Per.*

5. *C. medium.**Canterbury Bell.*

Stem erect, simple, hispid; leaves lanceolate, obtusely serrate, sessile, with 3 veins at base; flowers very large, broad at base, with a reflexed limb, deep blue, erect. A handsome species, common in gardens, where there are many varieties, with red, purple, or white, sometimes double flowers. *Bien.*

2. SPECULÀRIA.

Calyx 5-lobed. Corolla rotate, 5-lobed. Stamens with hairy filaments, shorter than the anthers. Style hairy, included. Stigmas 3. Capsule prismatic, 3-celled, opening by 3 lateral valves. *An.*

1. *S. perfoliata.**Clasping Bell-flower.*

Stem erect, simple, somewhat pubescent; leaves nearly orbicular, clasping and cordate at base, crenate; flowers sessile, axillary, solitary, or 3 together, deep blue; the upper ones only opening; corolla with spreading segments; calyx-segments acute, lanceolate. An erect plant, 8'–12' high, well marked by its clasping, roundish leaves, and deep blue flowers. Common in dry sandy fields. *June—July.*

2. *S. speculum.**Venus' Looking-glass.*

Stem diffuse, very branching; leaves oblong, crenate; flowers solitary. A pretty species, sometimes cultivated in gardens, named from the form of the blue corolla, which bears some resemblance to a concave mirror. *Aug.*

ORDER LXVII. Ericaceæ.—*Heath-family.*

SYNOPSIS OF THE GENERA.

SUBORDER I. Vacciniæ.

Calyx-teeth adherent to the ovary. Corolla monopetalous. Fruit a berry. Shrubs or evergreen, more or less woody plants.

1. GAYLUSSACIA. Ovaries 8–10-celled, 8–10-ovuled. Anthers awnless.

2. VACCINIUM. Ovaries 4–5-celled, or 8–10-celled, by false partitions, many-ovuled. Anthers often awned.

SUBORDER II. Ericinæ.

Calyx-tube free from the ovary. Corolla usually monopetalous, rarely with distinct petals. Shrubs or small trees, rarely merely woody at base.

3. ARCTOSTAPHYLOS. Corolla urceolate. Fruit a 5-seeded drupe. Trailing shrubs.

4. GAULTHERIA. Corolla ovoid-cylindric. Fruit 5-celled, 5-valved, included in the fleshy thickened calyx-lobes. Stem woody, trailing, with erect branches.

5. EPICÆA. Corolla salver-form, hairy within. Capsule 5-celled, 5-valved. Stem trailing, somewhat woody.

6. ANDROMEDA. Corolla ovoid-cylindric. Anthers opening by terminal pores. Capsule 5-celled, 5-valved. Shrubs.

7. CLÉTHRA. Petals 5, distinct. Capsule 3-celled, 3-valved. Shrubs.

8. RHODODÉNDRON. Corolla funnel-form, with 5 somewhat irregular lobes. Stamens and style much exsert. Capsule 5-celled, 5-valved. Shrubs.

9. KALNIA. Corolla somewhat campanulate, with 10 depressions on the inside, in which the 10 anthers are lodged in the bud. Evergreen shrubs.

SUBORDER III. Pyrolææ.

Calyx free from the ovary. Petals nearly or quite distinct. Evergreen, herbaceous plants.

10. PYROLA. Flowers racemed. Style long, usually declined. Valves of the capsule woody on the edges.

11. CHIMAPHILA. Flowers in corymbs or umbels. Style very short, with a broad, roundish stigma. Valves of the capsule smooth on the edges.

SUBORDER IV. Monotropææ.

Calyx free from the ovary. Petals usually, nearly, or quite distinct. Fleshy herbs, destitute of green foliage.

18. *MONOTROPA*. Flowers solitary.
12. *HYPOPICTS*. Flowers racemed.

1. *GAYLUSSÁCIA*.

Calyx 5-toothed. Corolla urceolate or ovoid, with a 5-cleft, reflexed limb. Stamens 10. Anthers awnless. Fruit a drupe resembling a berry, with 8—10 seeds, or rather little nuts. *Shrubs*.

1. *G. frondosa*.*Dangleberry.*

Smooth, with terete, slender branches; leaves oblong-obovate, obtuse, entire, pale and glaucous beneath, covered with minute resinous dots; flowers in loose bracteate racemes; pedicels filiform, bracted near the middle, drooping; corolla ovoid-campanulate, nearly globose, small, of a reddish-white color; berries large, blue, ripening late, covered when mature with a glaucous bloom, sweet and edible. This shrub is distinguished by its slender, nodding racemes, with filiform pedicels, and its late fruit. Stem 3—5 ft. high. Common in low woodlands and thickets. *June*.

2. *G. resinosa*. *Huckleberry*. *Whortleberry*.

Very branching; branches rigid, brownish, and slightly pubescent when young; leaves oval, oblong-ovate, or oblong, entire, more or less obtuse, clammy with resinous dots when young, petiolate, somewhat paler beneath; flowers small, greenish, striped with red, covered with resinous dots, in short, clustered, drooping racemes; pedicels short, with small, reddish, deciduous bracts; corolla ovoid-conic, contracted at apex; style exsert; berries black, destitute of bloom, ripe in July and August. A very common shrub in woods and neglected pastures, growing 1—4 ft. high, with a bushy top and brittle stem. *May—June*.

2. *VACCÍNIUM*.

Calyx 5-toothed. Corolla urceolate, campanulate, or cylindrical. Limb 4—5-cleft, revolute. Stamens 8—10. Anthers often 2-awned on the back. Berry 4—5-celled, many-seeded, sometimes apparently 8—10-celled.

1. *V. macrocarpon*.*Cranberry.*

Evergreen; stem trailing, filiform, with erect branches; leaves scattered, oblong, obtuse, glaucous beneath, about $\frac{1}{2}$ long, with slightly revolute edges; flowers rather large, on long, axillary pedicels; corolla deeply 4-parted, flesh-colored; segments reflexed, linear; berries on drooping, filiform pedicels, globular, bright scarlet, smooth, juicy, of a keen acid taste, ripe in Oct. A creeping shrubby plant, common in boggy meadows. *June*.

2. *V. pennsylvanicum*.*Low Blueberry.*

Low, smooth; leaves ovate-lanceolate, or oblong lanceolate, minutely but distinctly serrate, with mucronate teeth, smooth and shining on both sides, often with a pubescent midvein; corolla short, reddish-white, cylindric, somewhat campanulate. A low shrub in dense patches, 6'—12' high, with green, angular, warty branches. The berries are large, blue, and sweet, ripening early in July. Dry hills and woods. *May*.

3. *V. vacillans*.*Blueberry.*

Shrub with angular, green branches; leaves oval or obovate, more or less obtuse, of a pale, dull green, smooth on both sides, glaucous beneath, serrulate, ciliate; flowers numerous, in dense, subterminal, sessile racemes, on nearly naked branchlets; corolla yellowish or reddish-white, broadly cylindric-campanulate; berries blue, large and sweet, ripe in July and August. A common shrub, 1—2 ft. high, in open woods, and dry, hilly grounds. *May—June*.

4. *V. corymbosum*.*Swamp Huckleberry.*

Tall; leaves oblong, or oval-obovate, smooth on both sides, usually acute at both ends, slightly pubescent beneath when young; flowers in short, sessile racemes, on nearly leafless branchlets; corolla large for the genus, white or slightly tinged with red, cylindric, slightly contracted at the mouth; stamens included; berries large, deep-blue, ripe in August and September. A well-known species, 4—8 ft. high, common in swamps, distinguished by its flowers usually preceding the leaves. *May—June*.

5. *V. fuscátum*.*Black Bilberry.*

Tall; leaves oblong or oval-obovate, downy beneath and frequently on the veins above, acute at both ends, mostly entire; flowers in short, sessile racemes, on nearly naked branchlets; corolla ovoid, rather small, reddish or greenish-white; berry small, purplish-black, without bloom, subacid, tipped with the conspicuous calyx teeth. Equally common with the last, from which it is distinguished by its smaller flowers, smaller, black fruit, and the downy under surface of the leaves. Shrub, 4—8 ft. high. *June*.

3. *ARCTOSTAPHYLOS*.

Calyx 5-parted, persistent. Corolla ovoid; limb short, revolute, 5-toothed. Stamens 10. Drupe 5-seeded.

1. *A. úva-úrsi*.*Bearberry.*

Stem woody, trailing; leaves evergreen, thick and leathery, obovate, entire, smooth and shining; flowers white, tinged with rose, in short, drooping racemes, terminating the branches, furnished with small, scaly bracts; corolla bell-form, much contracted at mouth, hairy inside; berry red, insipid, and unpleasant to the taste. An evergreen shrub, very pretty in flower, quite common, especially northward. Mountains and hilly woods. *May—June*.

4. *GAULTHERIA*.

Calyx 5-cleft, with 2 bracts at base. Corolla ovoid-cylindric, with 5 short, revolute teeth. Stamens 10, hairy, included. Fruit 5-celled, 5-valved, inclosed when ripe in the thickened, fleshy lobes of the calyx, thus resembling a berry.

1. *G. procumbens*. *Checker-berry*, *Partridge-berry*.

Stem creeping, either above or below the surface, and throwing up simple, erect branches; leaves evergreen, obovate or oval, shining above, mostly entire, mucronate, in tufts at the summit of the branches; flowers few, axillary, nodding; corolla white, contracted at the mouth; berry bright red, and together with the leaves of a pleasant, spicy flavor. A little plant, very common in woods, especially under the shade of evergreens, well known for its aromatic qualities. The creeping stem sends up numerous branches 2'—4' high. *June—July*.

5. *EPIGÆA*.

Calyx 5-parted, with 3 bracts at base. Corolla salver-form; tube hairy within, as long as the 5 spreading segments of the limb. Stamens 10, with filiform filaments. Capsule 5-celled, 5-valved, many-seeded.

1. *E. repens*. *Trailing Arbutus*. *May-flower*.

Stem trailing, clothed with long, rusty hairs; leaves evergreen, ovate, mostly cordate at base, entire, reticulated, covered with a bristly, reddish pubescence; flowers erect, in small, axillary clusters, very fragrant; corolla white, often tinged with rose-color. A handsome plant, blooming early, and a universal favorite, on account of its beauty and fragrance.

6. *ANDRÓMEDA*.

Calyx 5-parted, minute, persistent. Corolla ovoid-cylindric; limb with 5 reflexed teeth. Stamens 8—10, included. Anthers opening by terminal pores. Capsule 5-celled, 5-valved, many-seeded.

1. *A. ligustrina*.*Panicked Andromeda.*

Leaves deciduous, obovate, or oblong-obovate, acuminate, pubescent beneath, nearly entire; flowers small, dull white, in dense, compound, naked racemes, forming contracted, leafless panicles, terminating the branches; corolla subglobose, pubescent without; filaments pubescent. A very common shrub, 3—5 ft. high, in swamps and low grounds. *June*.

2. *A. calyculata*.*Early Andromeda.*

Leaves evergreen, elliptical, obtuse, nearly entire, somewhat revolute on the margin, rusty beneath; flowers white, in leafy, terminal, somewhat recurved racemes; calyx bracteate at base; corolla oblong-cylindric; filaments smooth. An early flowering shrub in swamps and wet grounds, distinguished by its nearly 1-sided racemes of axillary flowers. *April—May*.

7. *CLÉTHRA*.

Calyx 5-parted, persistent. Petals 5, distinct. Stamens 10, exsert. Style slender, persistent. Stigma 3-cleft. Capsule 3-celled, 3-valved, many-seeded, inclosed in the calyx.

1. *C. alternifolia*.*Sweet-pepper Bush.*

Leaves wedge-obovate, serrate, smooth, green on both sides, acute, tapering to a short petiole; flowers white, fragrant, in erect, terminal, simple or compound racemes; calyx and peduncles hoary-pubescent; anthers light-brown. An elegant shrub, 4—10 ft. high, with foliage somewhat like that of the Alder, common in swamps and low grounds. *July—Aug.*

8. *RHODODÉNDRON*.

Calyx 5-parted, persistent. Corolla funnel-form or campanulate, 5-lobed, with spreading, usually unequal lobes. Stamens 5—10, and with the single style, usually exsert and declinate.

Anthers opening by 2 terminal pores. Capsule 5-celled, 5-valved, opening at summit.

1. *R. nudiflorum*.*Swamp Pink.*

Branchlets slightly hairy; leaves obovate, oblanceolate, or oblong, downy beneath; flowers large, varying from pale pink to purple; calyx-teeth minute; corolla slightly viscid; tube scarcely longer than the spreading lobes; stamens and style much exsert. A beautiful shrub 4–8 ft. high, of a very irregular and crooked growth, common in woods and low grounds. *May*.

2. *R. viscosum*.*White Swamp Pink.*

Branchlets hispid; leaves obovate, or oblong, mostly smooth, hairy on the midvein, margin and petiole; flowers white, sometimes tinged with rose-color, in large, terminal clusters, fragrant; calyx-teeth minute; corolla clammy, with viscid hairs; tube twice as long as the lobes; stamens slightly exsert; style much exsert. A handsome shrub, distinguished from the last by its viscid flowers, which usually do not appear till the leaves are fully grown. Stem 4–8 ft. high. Swamps and low grounds. *June–July*.

9. *KALMIA*.

Calyx 5-parted. Corolla rotate-campanulate, 5-lobed, with 10 cavities inside, corresponding to 10 prominences outside, in which the anthers are lodged at first. Filaments elastic, throwing the anther when released from the corolla against the pistil. Capsule globose, 5-celled, many-seeded. *Evergreen shrubs.*

1. *K. latifolia*.*High Laurel.*

Leaves mostly alternate, oval-lanceolate, or elliptical, acute at both ends, smooth, green on both sides; flowers in terminal corymbs, white, shaded with pink; peduncles clammy-pubescent; pedicels bracted. A splendid flowering shrub, 4–8 ft. high, of a very crooked and irregular growth, distinguished by its hard and compact wood. Not uncommon in woods and dry thickets. *June*.

2. *K. angustifolia*. *Low Laurel. Sheep Laurel.*

Leaves mostly opposite, or in threes, narrow-oblong, or oblong-lanceolate, light green, paler beneath, obtuse at each end; corymbs lateral and axillary; flowers deep red, about half as large as in the last; bracts minute, linear-lanceolate, 3 at the base of each pedicel. A low shrub, 2–4 ft. high, common in damp grounds. *June–July*.

10. *PYROLA*.

Calyx 5-parted, persistent. Petals 5, concave, deciduous. Stamens 10. Filaments subulate. Anthers large, pendulous, opening by 2 pores at apex, more or less 2-celled. Style long, often declined. Stigma 5-rayed, 5-tubercled at apex. Capsule 5 celled, 5-valved, many-seeded.

* *Stamens ascending. Style declinate.*

1. *P. rotundifolia*.*Round-leaved Pyrola.*

Leaves orbicular, thick and shining, entire, mostly shorter than the petioles; scapes 3-angled; flowers white, large, drooping, fragrant, in a long, terminal raceme; calyx-teeth lanceolate, acute; petals round-obovate. A common evergreen, propagating like the other species of the genus, by underground shoots, which terminate in a cluster of petiolate, radical leaves. Scape bracted, 6'–12' high. Woods. *July*.

2. *P. chlorantha*.*Green-flowered Pyrola.*

Leaves small, nearly orbicular, thick, dull green, much shorter than the petiole; raceme few-flowered; flowers rather large, nodding, remote, greenish-white, with very short bracts; calyx-teeth roundish-ovate, very short, obtuse; petals oblong. A smaller species than the last, distinguished by its dull green, much smaller leaves, and greenish flowers. Scapes 4–8-flowered, 3'–8' high. Common, especially in pine woods. *June*.

3. *P. elliptica*.*Oval-leaved Pyrola.*

Leaves thin, elliptical, smooth, mostly larger than the marginal petioles; racemes many-flowered; flowers white, nodding, fragrant; calyx-teeth ovate, acute; petals obovate. A common and elegant species, growing in woods, well marked by its thin, elliptical leaves. Scape 5'–10' high. *July*.

** *Stamens and style straight.*

4. *P. secunda*.*One-sided Pyrola.*

Leaves ovate, acute, finely serrate, thin, longer than the petiole; raceme dense, secund; flowers small, greenish-white; calyx-teeth ovate; petals ob-

long; style exsert; leaves in 1 or 2 tufts on a short stem; scape 8'–5' high. Rather common in woods. *July*.

11. *CHIMAPHILA*.

Petals 5, concave, spreading. Stamens 10. Filaments hairy and dilated in the middle. Anthers as in *Pyrola*. Style short and thick. Stigma broad, orbicular, obscurely 5-toothed on the margin. Capsule 5-celled, opening from the apex downwards.

1. *C. umbellata*.*Prince's Pine.*

Leaves wedge-lanceolate, tapering at base, serrate, dark-green on both sides, coriaceous, arranged somewhat in whorls around the low stem; flowers large, light purple or whitish, fragrant, 3–7 in a terminal corymb; bracts linear-subulate; anthers violet. A handsome evergreen, common in woods, having the general aspect of *Pyrola*, and propagating in the same manner, by underground shoots. Woods. *July*.

2. *C. maculata*.*Spotted Wintergreen.*

Leaves ovate-lanceolate, remotely serrate, usually of a dark brown hue, variegated with white on the upper surface; flowers large, purplish-white, 1–5 in terminal corymbs; filaments woolly. A pretty species, much resembling the last, but distinguished especially by its variegated leaves. Not uncommon in sandy woods. Stem 4'–8' high. *June–July*.

12. *HYPOPITYS*.

Sepals 4–5, bractlike, deciduous. Petals 4–5, distinct, fleshy, gibbous at base. Stamens 8–10. Filaments subulate. Anthers 2-celled. Style columnar, hollow. Stigma disklike, bearded at the margin. Capsule 4–5-celled, 4–5-valved. *Leafless herbs.*

1. *H. lanuginosa*.*Pine Sap.*

Clothed with soft pubescence; stem simple, furnished with alternate scales instead of leaves; flowers brownish-white or tawny, as well as the rest of the plant, in close, bracted racemes, at first nodding, afterwards erect; terminal flower with 10 stamens and 5 petals; the rest with 8 stamens and 4 petals; capsule subglobose. A fleshy, leafless plant, parasitic, especially on the roots of beeches and pines. Scape 6'–10' high. Rather common in rich woods. *July–Aug. An.*

13. *MONOTROPA*.

Calyx represented by 2–4 deciduous bracts. Petals 5, distinct, fleshy, gibbous at base. Stamens 10. Filaments hairy. Anthers short, 2-celled. Stigma orbicular, crenately 5-toothed, naked. Capsule 5-celled.

1. *M. uniflora*.*Indian Pipe.*

Plant smooth, fleshy, white throughout, scentless; stem low, simple, furnished with lanceolate scales instead of leaves, one-flowered; flower large, smooth inside and out, nodding at first, finally erect. A curious plant, common in rich woods, springing up among the decaying leaves. *June–July. An.*

ORDER LXVIII. Aquifoliaceæ.—*Holly-family.*1. *ILEX*.

Calyx 4–5-toothed. Corolla 4–5-parted, somewhat rotate. Stamens 4–5. Stigmas 4–5, united or distinct. Berry 4–5-seeded.

1. *I. opaca*.*American Holly.*

Leaves evergreen, oval, flat, tapering at both ends, coriaceous, smooth and shining, armed with strong, spiny teeth, on the undulate margins; flowers small, greenish-white, in loose clusters, which are axillary, or situated at the base of the young branches; calyx-teeth acute; berry ovate, red when ripe. A tree of middling size, marked by its glossy spiny foliage, and red berries. Abundant in some districts near the sea-coast. *June*.

2. *PRINOS*.

Flowers mostly polygamous. Calyx usually 6, rarely 4–5-cleft. Corolla 6, rarely 4–5-cleft. Stamens 6, rarely 4 or 5. Stigmas 6, rarely 4 or 5. Berry roundish, usually 6-seeded.

1. *P. verticillatus*.*Black Alder.*

Leaves deciduous, oval, obovate, or wedge-lanceolate, serrate, acuminate, tapering at base, pubescent on the veins beneath; flowers white, axillary, on very short peduncles; fertile ones closely aggregated; sterile ones somewhat

ambelled; pedicels 1-flowered; berries roundish, scarlet, persistent through the winter. A shrub with very variable foliage, 4–8 ft. high, common in swamps and low grounds. *June*.

ORDER LXXI. Primulaceæ.—Primrose-tribe.

SYNOPSIS OF THE GENERA.

1. *PRIMULA*. Flowers umbelled. Leaves radical.
2. *TRIENTALIS*. Corolla rotate, 6–8, usually 7-parted. Cauline leaves in a single whorl.
3. *LYSIMACHIA*. Corolla yellow, rotate, 5-parted.
4. *SAMOLUS*. Corolla campanulate, white. Leaves alternate.

1. PRIMULA.

Calyx tubular, 5-cleft. Corolla salver-form, spreading above, 5-lobed. Stamens 5, included. Stigma globose. Capsule opening by 10-clefts at apex. *Per*.

1. *P. auricula*. *Auricula*.

Leaves obovate, fleshy, entire or serrate; scape many-flowered, as long as the leaves; flowers showy and fragrant, in an involucre umbel, in cultivation varying to almost all possible hues; involucre-leaves short; calyx mealy. A well-known flower, long an especial favorite of the florists, of which numberless varieties are cultivated. *May*.

2. *P. elatior*. *Oxlip Primrose*.

Leaves toothed, rugose, hairy on both sides; umbel many-flowered; outer flowers nodding; flowers yellow, scentless; corolla flat. A British species, not uncommon in cultivation. *April–May*.

3. *P. veris*. *English Cowslip*.

Leaves toothed, rugose, hairy beneath; umbels many-flowered; flowers all nodding, yellow; calyx angular; corolla concave. The plant has a strong smell of anise.

4. *P. vulgaris*. *Common Primrose*.

Leaves obovate, or oblong, rugose, villous beneath, toothed; umbel radical; the pedicels rising directly from the root, as long as the leaves; flowers in a wild state, yellow and single, but in cultivation passing into numerous other colors, often double, and sometimes on a scape. The plant smells of anise. Common in cultivation. *April*.

2. TRIENTALIS.

Calyx mostly 7-parted. Corolla mostly 7-parted, flat, without any tube. Stamens mostly 7. Filaments united in a ring at base. Capsule many-seeded. *Per*.

1. *T. Americana*. *Chick Wintergreen*.

Stem low, simple, slender, crowned by a whorl of leaves at top, naked below; leaves 5–8 in a whorl, narrow-lanceolate, tapering at both ends, serrulate, thin and delicate, light green; flowers few, on very slender peduncles, projecting from among the leaves, white and starlike; sepals linear, acuminate, shorter than the segments of the corolla. A very slender and delicate plant, common in damp rich woods. Stem 6'–10' high. *May*.

3. LYSIMACHIA.

Calyx 5-parted. Corolla 5-parted, rotate, with a very short tube. Limb 5-parted, spreading. Stamens 5, often united in a ring at base. Capsule globose, 5–10-valved, opening at apex. *Per*.

1. *L. stricta*. *Upright Loosetrife*.

Stem erect, simple or branching; leaves opposite, or in threes, lanceolate, tapering at both ends, smooth, punctate, sessile; flowers numerous, on slender pedicels, whorled, the numerous whorls forming a long, cylindrical raceme; pedicels nearly horizontal, with a subulate bract at base; corolla yellow, spotted with purple; capsule 5-seeded. An elegant plant, 1–2 ft. high, in swamps and wet grounds. After flowering, bulblets appear in the axils. Common. *July*.

2. *L. ciliata*. *Fringed Loosetrife*.

Stem nearly square, erect, branching; leaves ovate-lanceolate, entire, opposite, rarely in fours, rounded or cordate at base, with ciliate petioles; flowers large, light yellow, nodding, on slender, axillary peduncles; stamens inserted in a ring, distinct, alternating with 5 sterile filaments. A rather elegant species, 2–3 ft. high, common in low grounds. *July*.

3. *L. lanceolata*. *Narrow-leaved Loosetrife*.

Stem erect, branching, 4-angled; leaves lanceolate or linear-lanceolate, tapering at both ends, opposite, on short, ciliate petioles; flowers large, yellow, nodding, on slender, axillary peduncles; stamens united in a ring, alternating with 5 sterile filaments. A smaller and more slender plant than the last, 1–2 ft. high, distinguished from the last by its narrow leaves, acute at both ends. Common in swamps. *July*.

4. *L. quadrifolia*. *Four-leaved Loosetrife*.

Stem erect, simple, somewhat hairy; leaves whorled in fours, rarely in threes or sixes, lanceolate, or ovate-lanceolate, dotted; flowers nodding, yellow, on slender, axillary peduncles, shorter than the leaves; corolla marked with purple lines; filaments united at base; anthers short. A common species, in sandy soils. Stem 10'–18' high. *June*.

4. SAMOLUS.

Calyx partly adherent to the ovary, 5-cleft. Corolla somewhat campanulate, 5-cleft. Stamens 5, alternating with 5 sterile filaments. Capsule opening by 5 valves at top, many-seeded. *Per*.

1. *S. floribundus*. *Water Pimpernel*.

Stem branching, leafy; leaves entire, obtuse, alternate; radical ones obovate, or spatulate, petiolate; cauline oblong or oval; uppermost subsessile; flowers in numerous, loose racemes, paniculately arranged, white; pedicels capillary, with minute bracts near the middle; calyx-teeth ovate, shorter than the corolla. A low, smooth shrub, 6'–12' high, not uncommon in low grounds. *June–Sept*.

ORDER LXXII. Plantaginaceæ.—Plantain-family.

1. PLANTAGO.

Calyx-teeth 4, persistent, dry and scarious on the margin. Corolla tubular, withering, with a 4-cleft, reflexed border. Stamens mostly exsert and very long. Capsule an ovoid, 2-celled pyxis. *Acaulescent*.

1. *P. major*. *Common Plantain*.

Leaves large, ovate, tapering abruptly at base, scarcely toothed, very strongly ribbed, with stout, nearly parallel veins, on long, channelled, fleshy petioles; spike long, cylindrical; flowers densely imbricated, whitish, inconspicuous. A very common plant, about paths and houses, in damp soil. Scapes 8'–2 ft. high. *June–Sept*.

2. *P. lanceolata*. *Ribwort*.

Leaves lanceolate, strongly 3–5-nerved, nearly entire, tapering at both ends, more or less hairy on the petioles and veins; petioles slender; scape slender, angular, more or less pubescent; spike ovate, densely flowered; stamens whitish, much exsert, with dark anthers. A smaller and more slender species than the last, with scapes 6'–20' high. Common in dry, grassy fields. *May–Oct*.

3. *P. maritima*. *Sea Plantain*.

Mostly smooth; leaves linear, fleshy, channelled above, rounded in the lower side, nearly entire; scape terete; flowers whitish, in dense, cylindrical spikes, sometimes scattered below. A very fleshy species, common in salt marshes near the coast, and is distinguished by its numerous half-terete, channelled leaves. Scapes 4'–6' high. *July–Aug*.

ORDER LXXIII. Plumbaginaceæ.—Thrift-family.

1. STÁTICE.

Flowers scattered, or loosely spicate in a compound corymb, 1-sided, 2–3-bracted. Calyx funnel-form, dry and membranous, persistent. Petals 5, mostly distinct, with long claws. Stamens 5, attached at base. Styles 5, distinct. Fruit indehiscent, invested with the calyx. *Per*.

1. *S. Limonium*. *Marsh Rosemary*.

Leaves radical, lanceolate, or oblong-obovate, 1-veined, entire, mucronate below the tip, thick and fleshy, dull green, on long petioles; scape with wither-

ing sheaths, very branching, forming a large, flat-topped, compound corymb, of small, pale-blue flowers, which are sessile in second spikes upon the branchlets. A rather pretty plant, common in salt marshes, with a scape about a foot high. Root large and woody, very astringent. *Aug.—Oct.*

ORDER LXXIV. Lentibulacæ.—Bladderwort-family.

1. UTRICULARIA.

Calyx 2-parted, with nearly equal lips. Corolla irregularly 2-lipped, personate; the lower lip projecting, and sometimes closing the throat. *Aquatics.*

1. U. inflata.

Whorled Bladderwort.

Upper leaves floating in a whorl of 5 or 6, which are inflated into oblong bladders, but dissected at apex into capillary segments; lower leaves submerged, very finely dissected into capillary segments, and bearing many little bladders; scape projecting above the water, 4–6-flowered; flowers large, yellow, very irregular, spurred; spur about as long as the corolla, striate, emarginate; upper lip of the corolla broad-ovate, entire; lower 3-lobed. A curious aquatic, with irregular, handsome, yellow flowers, and finely dissected leaves. Rather common in ponds. *July—Aug. Per.*

2. U. vulgaris.

Common Bladderwort.

Leaves all submerged, crowded, dissected into very numerous, capillary segments, furnished with little bladders; flowers 5–12, pedicellate, yellow, very showy, alternate; lower lip nearly as long as the upper one, with a projecting palate striped with brown, which closes the throat; spur conical, obtuse, much shorter than the corolla. A showy aquatic, very common in ponds and stagnant pools. Scape 4'–6' above the water. *June—Aug. Per.*

3. U. cornuta.

Horned Bladderwort.

Leafless; scape rooting and scaly at base, 2–7-flowered; flowers large, close together, deep yellow; pedicels very short; lower lip of the corolla larger than the obovate upper one, broad, projecting at the centre, and deflexed at the edges, emarginate; spur subulate, acute, rigid, inclined downwards, as long as the corolla, or longer. Not uncommon in damp, peaty soils, or sandy swamps. Scape 8'–12' high. *June—July.*

ORDER LXXV. Orobanchacæ.—Beechdrops-family.

1. EPIPHËGUS.

Flowers racemose or spicate on the branches; upper ones barren, with a long, tubular, recurved corolla, and long filaments and style; lower ones fertile, with a very short corolla, which rarely opens, and with very short stamens and style. Stigma capitate, somewhat 2-lobed. Capsule 2-valved at apex. *Per.*

1. E. Virginiana.

Beechdrops.

Stem leafless, branching, angular, purplish-brown; branches slender, virgate; flowers alternate, remote, extending the whole length of the branches; corolla of the upper flowers of a whitish color mingled with purple, 4-toothed; upper lip broader than the lower one, emarginate; root a round, scaly ball, covered with short, stiff, projecting fibres. A parasitic plant, attaching itself to the roots of the Beech and other trees. Stem 8'–12' high, furnished with a few scales instead of leaves. *Woods. Aug.—Sept.*

2. APHYLLON.

Flowers perfect, solitary, bractless. Calyx 5-cleft, regular. Corolla subbilabiate, with a long, curved tube, and a spreading border; upper lip 2-cleft; lower lip 3-cleft; stamens included. Stigma 2-cleft. Capsule ovoid, acute, 2-valved, many-seeded. *Per.*

1. A. uniflorum. One-flowered Broomrape.

Scapes 1-flowered, naked, often clustered; flowers yellowish-white, tinged and bordered with purple, with 2 tufts of yellow down in the throat. A hairy, leafless plant, with a short, often subterranean stem, sending up one or more terete, simple scapes, 3'–6' high. *Woods and thickets. Common. May—June.*

ORDER LXXVI. Bignoniacæ.—Catalpa-family.

1. TÉCOMA.

Calyx campanulate, 5-toothed. Corolla funnel-form, dilated at the throat, with a 5-lobed limb, somewhat bilabiate. Stamens 4, didynamous. Capsule long and narrow, 2-celled, 2-valved. Seeds winged. *Climbing shrubs.*

1. T. radicans.

Trumpet Creeper.

Stem woody, climbing by means of rootlets; leaves pinnate; leaflets 5–11, ovate, acuminate, dentate, somewhat puberulent beneath; flowers corymb; corolla large, 2'–3' long, orange and scarlet, very showy; stamens included. A splendid climber, native in Penn. and southward; often cultivated. *July—Aug.*

2. CATÁLPA.

Calyx 2-lipped. Corolla campanulate; tube inflated; limb irregular, undulate, 4–5-cleft. Stamens 5, 2 only usually have anthers. Stigma 2-lipped. Capsule long and slender, 2-celled.

1. C. bignonioides.

Catalpa.

Leaves cordate, or ovate-cordate, acuminate, entire, opposite, or in threes, petiolate, downy beneath; flowers in compound panicles, white, tinged and spotted with purple and yellow, large and showy; calyx teeth mucronate; capsule cylindric, pendent, 6'–12' long. A noble tree, common in cultivation. *June—July.*

ORDER LXXVIII. Scrophulariacæ.—Figwort-family.

SYNOPSIS OF THE GENERA.

SUBORDER I. Antirrhinidæ.

Upper lip, or upper lobes of the corolla inclosing the lobes of the lower lip in the bud.

* Upper leaves alternate.

1. VERBÁSCUM. Corolla nearly regular, with 5 slightly unequal segments. Stamens 5, perfect.

2. LINÁRIA. Corolla personate; tube inflated, spurred behind.

3. ANTIRRHINUM. Corolla personate; tube gibbous, not spurred behind.

** Leaves all opposite.

4. SCROPHULÁRIA. Corolla tube subglobose; limb bilabiate. Upper lip with 4 erect lobes; lower lips spreading.

5. CHELONE. Corolla tubular, inflated, bilabiate. Anthers woolly. Seeds winged.

6. MIMULUS. Corolla ringent. Lower lip with a prominent palate. Fertile stamens 4.

7. GRATIOLA. Corolla bilabiate. Fertile stamens 2. Sterile filaments 2, simple included, sometimes wanting.

8. LYSÁNTHES. Corolla bilabiate. Fertile stamens 2. Sterile filaments 2, forked, inserted in the throat of the corolla.

SUBORDER II. Rhinanthidæ.

Lower lip, or lower lobes of the corolla covering the upper ones in the bud.

* Corolla with spreading, nearly equal lobes.

9. DIOTÁLIS. Corolla tubular-campanulate, ventricose. Leaves alternate.

10. VERÓNICA. Corolla 4-parted. Stamens 2.

11. GERÁRDIA. Corolla tubular, swelling above, with 5 more or less unequal lobes. Stamens 4.

** Corolla bilabiate.

12. CASTILLEJA. Flowers inclosed in colored bracts. Lower lip of the corolla very short.

13. PEDICULÁRIS. Flowers in dense spikes. Calyx tubular, 2–5-toothed. Lower lip of the corolla spreading.

14. MELAMPYRUM. Calyx campanulate, with 4 mucronate teeth. Upper lip of the corolla shorter than the lower lip.

1. VERBÁSCUM.

Calyx 5-parted. Corolla rotate, with 5 nearly equal lobes. Stamens 5, all perfect, declinate. Capsule globose or ovoid, many-seeded. *An.*

1. V. Thápsus.

Mullein.

Plant densely woolly throughout; stem tall, rigidly erect, usually simple; leaves decurrent, oblong, acute; flowers yellow, in a long, dense, terminal, cylindrical spike; two lower stamens usually beardless. A very conspicuous plant, 4–7 ft. high, found every where in neglected fields, and along road-sides. Introduced. *June—Aug.*

2. *V. Blattaria*.*Moth Mullein.*

Stem simple or branching above, leafy, erect; leaves smooth, clasping, oblong, coarsely serrate, the lower petiolate; flowers pedicellate, in a long, leafy raceme, yellow or white, usually tinged with purple; stamens unequal, with purple, woolly filaments. A much slenderer plant than the last, smooth and green throughout, with larger and handsomer flowers. Stem 2–3 ft. high. Road-sides; common in some districts. Introduced. *June–July.*

2. *LINARIA*.

Calyx 5-parted. Corolla personate; upper lip bifid, reflexed; lower lip 3-cleft; palate prominent, nearly closing the throat; tube inflated and spurred. Stamens 4. Capsule opening at the summit, by 1–2 pores.

1. *L. vulgaris*.*Toad-flax Snapdragon.*

Smooth and glaucous; stem erect, with short, leafy branches; leaves alternate, crowded, linear-lanceolate; flowers yellow, in dense, terminal spikes; bracts longer than the short pedicels; corolla with a long spur, the throat completely closed by the orange-colored palate. Common along road-sides. *July–Aug. Per.*

2. *L. Canadensis*.*Canadian Snapdragon.*

Smooth; stem slender, erect, nearly simple; leaves linear, erect, smooth, scattered, obtuse; flowers small, blue, in an elongated, slender, terminal raceme, on short pedicels; spur filiform, curved, as long as the corolla. A more slender plant than the last, common along road-sides and in sandy soils. The stem is 6'–15' high, and often has procumbent or ascending shoots at base, with small, remote, chiefly opposite leaves. *June–Oct. An.*

3. *ANTIRRHINUM*.

Calyx 5-sepaled. Corolla gibbous at base; upper lip bifid, reflexed; lower lip trifid, closed by the prominent palate. Capsule without valves, opening by 3 pores. *Per.*

1. *A. majus*.*Snapdragon.*

Stem erect; leaves lanceolate, opposite; upper ones alternate; flowers in terminal racemes, pink, with the lip white, and the mouth yellow; sepals lanceolate, acute, covered with glandular hairs. There are varieties with scarlet and with double flowers. Gardens. *Aug–July. Per.*

4. *SCROPHULARIA*.

Calyx-segments 5, acute. Corolla-tube subglobose; limb contracted, somewhat 2-lipped; upper lip with 4 erect lobes; lower lip spreading. Stamens 4, declinate. A 5th stamen is also present in the form of a scale on the inside of the corolla-tube, at the summit. Capsule 2-celled, many-seeded. *Per.*

1. *S. nodosa*.*Figwort.*

Smooth; stem tall, angular, branching; leaves ovate or ovate-oblong, the upper ones varying to lanceolate, all acute, dentate or serrate, petiolate, mostly cordate or rounded at base; flowers of a dull purple, in loose cymes, which are arranged in a long, narrow, terminal, leafless panicle, with opposite branches; calyx-teeth broad, obtuse, somewhat margined. A rank, tall plant 4–6 ft. high, growing in low grounds and thickets. Not common in N. England, but abundant Westward and Southward. *July.*

5. *CHELONE*.

Calyx-sepals distinct, with 3 bracts at base. Corolla tubular, inflated, 2-lipped; upper lip arched, emarginate; lower lip bearded at the throat, 3-lobed. Stamens with woolly filaments and woolly, cordate anthers; 5th filament sterile and smaller than the others. Seeds with broad, membranous margins. *Per.*

1. *C. glabra*.*Snake-head.*

Smooth; stem erect, simple or branching; leaves opposite, lanceolate, acuminate, serrate, on very short petioles; flowers large, white, varying to rose-color, in dense, short spikes; corolla with an open throat and contracted mouth; style long, exsert. A common plant, 2–3 ft. high, growing in wet grounds, distinguished by the flowers, which have some resemblance to the open mouth of a snake. *July–Sep.*

6. *MIMULUS*.

Calyx prismatic, 5-toothed. Corolla tubular, ringent; upper lip erect, and reflexed at the sides, 2-lobed; lower lip with a prominent palate, 3-lobed. Stamens 4. Stigma thick, 2-lipped. Capsule 2-celled, many-seeded. *Per.*

1. *M. ringens*.*Monkey-flower.*

Smooth; stem erect, square, branching; leaves sessile, oblong-lanceolate or lanceolate, acuminate, serrate, more or less clasping at base; flowers large, on solitary, axillary, square peduncles, longer than themselves, and curved upwards; corolla pale-blue, with a yellow throat. A handsome plant, 1–2 ft. high, common in wet places. *July–Aug.*

7. *GRATIOLA*.

Calyx-segments, nearly equal. Corolla 2-lipped; upper lip entire or 2-cleft; lower lip without a prominent palate, 3-cleft. Fertile stamens 2, included usually with an anterior pair of sterile filaments. Style dilated or 2-lipped at apex. Capsule 2-celled, 4-valved, many-seeded.

1. *G. Virginiana*. *Virginian Hedge Hyssop.*

Nearly or quite smooth; stem low, erect, simple or branching; leaves lanceolate or oblong-lanceolate, sessile, opposite, slightly serrate, tapering at base; flowers small, on axillary peduncles, longer than the leaves; corolla whitish, generally with a pale yellow tube, twice longer than the calyx; sterile filaments none. A low plant 3'–5' high, common in muddy grounds. *July–Aug. Per.*

2. *G. aurea*.*Golden Hedge Hyssop.*

Smooth; stem decumbent at base, erect above, square, simple, or with ascending branches; leaves oblong-lanceolate, nearly entire, few-nerved, opposite, sessile; flowers solitary, on axillary peduncles scarcely equalling the leaves; larger than in the last, golden yellow; sterile filaments 2, minute. A handsome plant, 3'–8' high, common on the borders of ponds. *Aug–Sep. Per.*

8. *ILYSANTHES*.

Calyx 5-parted. Corolla 2-lipped; upper lip short, erect, 2-cleft; lower large, spreading, 3-cleft. Fertile stamens, 2, included, posterior. Sterile stamens 2, anterior, forked, mostly without anthers, with one of the divisions glandular and obtuse, and the other short and smooth, acute. Style 2-lipped at apex. Capsule many-seeded.

1. *I. gratioides*.*False Pimpernel.*

Smooth; stem ascending, branching, low; leaves opposite, sessile, ovate or oblong, sparingly serrate, more or less obtuse, the lower ones sometimes obovate and tapering at base; flowers small, pale-blue, solitary, on axillary, bractless peduncles; corolla erect, twice longer than the calyx. A low plant, 2'–4' high, common in wet and muddy grounds. *July–Aug. Per.*

9. *DIGITALIS*.

Calyx 5-parted. Corolla campanulate, ventricose. Limb of 5 nearly equal lobes. Capsule ovate, 2-celled, 2-valved, with a double dissepiment.

1. *D. purpurea*.*Foxglove.*

Stem erect; leaves oblong, rugose, downy, crenate, lower ones crowded, petiolate; flowers large, crimson, beautifully spotted within, in a long showy, 1-sided raceme; calyx-segments ovate-oblong; corolla obtuse, upper lip entire. A tall, showy biennial, common in gardens. *July.*

10. *VERÓNICA*.

Calyx 4-parted. Corolla rotate or tubular, deeply 4-cleft; lower segments usually narrower than the rest. Stamens 2, exsert, one on each side of the upper lobe of the corolla. Style entire. Stigma single. Capsule compressed, 2-furrowed, often emarginate at apex, 2-celled, few to many-seeded.

* Tall plants, with verticillate leaves and tubular corollas.

1. *V. Virginea*.*Culver's Physic.*

Mostly smooth; stem erect, simple, straight, tall; leaves lanceolate, petiolate, acute, or acuminate, finely serrate, in whorls of 4–7, glaucous beneath; flowers white, in dense, terminal and subterminal, panicle spikes; corolla tubular, pubescent within; stamens and style much exsert, twice as long as the corolla; capsule not emarginate. A tall, elegant plant, 2–6 ft. high, not uncommon in rich, low grounds, frequent in cultivation. *July. Per.*

** Leaves opposite. Corolla nearly or quite rotate.

2. *V. Americana*.*Brooklime.*

Smooth and rather fleshy; stem decumbent at base, and then erect; leaves mostly petiolate, ovate, or oblong, serrate, more or less acute, abrupt, or somewhat cordate at base; flowers small, in opposite, loose racemes, on slender,

spreading pedicels twice longer than the bracts; corolla pale blue, marked with brownish lines; capsule turgid, emarginate. A low, fleshy plant, 6'—12' high, not uncommon in wet grounds. *June—Aug. Per.*

3. *V. scutellata.*

Marsh Speedwell.

Smooth; stem ascending, weak; leaves linear, sessile, acute, remotely denticulate; racemes axillary, very loose and slender, with a few remote, scattered flowers, on filiform, divaricate pedicels, very much longer than the bracts; corolla rather large, pale flesh-color, with purple lines; capsule flat, very broad for its length, emarginate. A slender species, 6'—12' high, common in swamps. *June—Aug. Per.*

4. *V. serpyllifolia.*

Common Speedwell.

Nearly or quite smooth; stem low, prostrate, much branched at base, with ascending, simple branches; leaves ovate or oblong, somewhat crenate, obtuse; lowest roundish, petiolate; upper sessile, passing into lanceolate, entire bracts; flowers in loose, bracted, terminal racemes, elongated in fruit; corolla blue and white, marked with purple lines, scarcely longer than the calyx; capsule broader than long, obtusely emarginate. A pretty little plant, 2'—6' high, very common in grassy fields and pastures. *May—Sep. An.*

5. *V. peregrina.*

Purslane Speedwell.

Nearly smooth; stem ascending, branched; lowest leaves petiolate, oval-oblong, dentate, obtuse; upper sessile, oblong, obtuse; uppermost oblong-linear, entire, longer than the subsessile, solitary, axillary flowers; corolla whitish; capsule orbicular, slightly emarginate. A weed, 4'—10' high, common in cultivated grounds. *May—June. An.*

6. *V. arvensis.*

Field Speedwell.

Pubescent; stem erect, simple, or diffusely branched; leaves ovate, crenate, cordate at base; lower petiolate; upper ones mostly alternate, sessile, lanceolate; flowers solitary, axillary, on pedicels shorter than the calyx, blue, marked with purple lines; capsule obovate, with rounded lobes. A low, pale-green, hairy plant, 3'—8' high, common in dry fields. *May—June. An.*

11. GERÁRDIA.

Calyx 5-parted. Corolla tubular, swelling above, with 5, spreading, more or less unequal lobes; 2 upper ones usually the smallest. Stamens 4, included, hairy. Style elongated. Capsule ovate, acuminate, many-seeded.

* *Flowers purple or rose-color. Leaves linear. An.*

1. *G. purpurea.*

Purple Gerardia.

Smooth; stem erect, angular, with long spreading branches; leaves linear, acute, rough on the margin; flowers axillary, solitary, subsessile; peduncles shorter than the calyx; calyx-teeth subulate; corolla bright purple, showy, smooth or slightly downy. A slender, very handsome plant, 8'—20' high, common in wet grassy grounds. *Aug.*

2. *G. maritima.*

Sea Gerardia.

Smooth and somewhat fleshy; stem low, angular, branched from the base; leaves linear, short, fleshy, mostly obtuse; peduncles as long as the calyx; flowers half the size of the last; calyx-teeth short, truncate; corolla purple. A smoother species than the last, which it much resembles, distinguished by the thick, fleshy leaves and truncate calyx-teeth. Stem 3'—6' high. Salt marshes. *July—Sep.*

3. *G. tenuifolia.*

Slender Gerardia.

Nearly or quite smooth; stem very slender, very branching, diffuse; leaves linear, very narrow, entire, obtuse; flowers rather small, axillary, often opposite; peduncles filiform, nearly as long as the leaves; calyx-teeth short, acute; corolla pale purple, with a spreading, subequal border. A delicate and elegant species, usually very branching, but sometimes simple. Stem 6'—15' high, common in dry, rocky woods. *Aug.—Sep.*

** *Corolla yellow. Leaves broad, entire, or variously lobed and toothed. Per.*

4. *G. flava.*

Yellow Gerardia.

Pubescent; stem erect, simple, or branching towards the summit; leaves opposite, sessile, ovate-lanceolate, or oblong, entire, obtuse; lower ones usually sinuately toothed; flowers large, opposite, axillary, on very short peduncles; calyx-segments oblong, obtuse, shorter than the tube. A tall, very showy plant, 2—3 ft. high. Common in dry woods. The flowers are 1'—1½' long. *Aug.*

5. *G. quercifolia.*

Oak-leaved Gerardia.

Smooth and glaucous; stem tall, simple or somewhat branching; leaves

mostly opposite; lower ones twice pinnatifid; upper oblong-lanceolate, pinnatifid or entire; flowers pedunculate, axillary, opposite, of a brilliant yellow, large and showy; peduncles nearly as long as the calyx; segments of the calyx linear-lanceolate, equalling the tube. A showy plant, much resembling the last, 4—6 ft. high. Common in rich woods. *Aug.*

6. *G. pedicularia.*

Bushy Gerardia.

Pubescent or somewhat smooth; stem erect, very branching; branches opposite; leaves opposite, ovate, pinnatifid; the lobes variously cut and toothed; petioles short, hairy; flowers large, yellow, often opposite, axillary, on pedicels longer than the calyx; segments of the calyx usually toothed, as long as the hairy tube; corolla 1' long, with rounded, spreading segments. A bushy, but truly splendid species, 3—4 ft. high. Common in dry woods and thickets. *Aug.*

12. CASTILLEJA.

Calyx tubular, flattened, 2—4-cleft, included in more or less colored bracts. Corolla-tube included in the calyx; upper lip long and narrow, arched, compressed, inclosing the stamens; lower lip short, 3-lobed. Stamens 4. Anthers oblong-linear, 2-lobed, with unequal lobes; the exterior lobe fixed by the middle; the interior pendulous. Capsule many-seeded. *Per.*

1. *C. coccinea.*

Painted Cup.

Pubescent; stem erect, angular, simple; leaves alternate, sessile, pinnatifid, with linear and divaricate segments; radical ones clustered at base; bracts 3-cleft, colored with bright scarlet at apex, rarely yellow, longer than the corolla; flowers subsessile, in short, dense, terminal spikes; calyx and corolla greenish-yellow, the former tinged with scarlet at tip. A beautiful and remarkable plant, distinguished by its dense spikes of inconspicuous flowers, concealed in brilliant scarlet bracts. Stem 10'—20' high. Not uncommon in meadows. *May—June.*

13. PEDICULARIS.

Calyx campanulate or tubular, 2—5-cleft; the segments leafy, or sometimes obliquely truncate. Corolla strongly bilabiate; upper lip arched, compressed, emarginate; lower lip spreading, 3-lobed. Stamens 4, included in the upper lip. Capsule oblique, mucronate. *Per.*

1. *P. Canadensis.*

Lousewort.

Pubescent; stems low, erect, simple, clustered; leaves petiolate, alternate; lowest pinnately dissected; the rest subpinnatifid; lobes oblong-ovate, crenately toothed; flowers in short, dense, hairy, terminal heads; calyx 2-toothed, or truncated, in an oblique, downward direction; corolla greenish-yellow, or dull red; upper lip vaulted, forming a helmet or galea, terminating in 2 setaceous teeth, turned downwards; capsule compressed, long-acuminate. A low, hairy plant, 6'—15' high. Common in fields and pastures. *May—July.*

14. MELAMPYRUM.

Calyx campanulate, 4-cleft; the lobes with long, bristly points. Corolla-tube cylindrical, larger above; upper lip arching, compressed, somewhat shorter than the nearly erect, 3-lobed lower lip. Stamens 4, included in the upper lip. Capsule usually 4-seeded, oblique, compressed. *An.*

1. *M. pratense.*

Cow-wheat.

Smooth; stem erect, branching; leaves opposite, lanceolate, or linear, petiolate; upper ones larger, with a few long, setaceous teeth, tapering to an obtuse point at the extremity; flowers solitary in the axils of the upper leaves, remote; calyx smooth; corolla yellowish, twice the length of the calyx. A slender annual, 6'—10' high, common in dry and open woods. *July—Aug.*

ORDER LXXIX. Verbenaceæ.—Vervain-family.

1. VERBENA.

Calyx tubular, 5-toothed, often with 1 tooth shorter than the rest. Corolla funnel-form, sometimes curved; limb with 5 slightly unequal lobes. Stamens 4, rarely 2, included. Style slender. Stigma capitate. Fruit splitting into 4 achenia.

1. *V. hastata.*

Blue Vervain.

Stem tall, erect, with a few opposite branches above; leaves lanceolate, sharply serrate, scabrous, petiolate; the lower ones often lobed or hastate; flowers sessile, in dense, slender, erect spikes, usually arranged in terminal

panicles; corolla purplish-blue; stamens 4. A tall, showy plant, 3–5 ft. high. Common in waste places and low grounds. *July–Sep.*

2. *V. urticifolia*. *Nettle-leaved Vervain.*

Somewhat pubescent; stem tall, erect, branching; leaves ovate, or oblong-ovate, acute, coarsely serrate, petiolate, strongly nerved; flowers minute, remote, white, sessile in elongated, very slender, axillary and terminal spikes. A weed of mean appearance, with leaves somewhat resembling those of the Nettle; common in waste places. Stem 2–3 ft. high. *July–Aug. Per.*

3. *V. Aublétia*. *Garden Verbena.*

Stem weak, decumbent at base, erect above, square, viscid-pubescent, with opposite branches; leaves oval, deeply cut and toothed, on short petioles; flowers large, in solitary, dense, corymbose clusters, on long peduncles; bracts downy, nearly as long as the downy calyx, narrow, persistent; corolla rose-red or scarlet, with emarginate lobes. A very pretty plant, frequent in house cultivation, often also cultivated in the open air. Stem 1–2 ft. high. *May, and all summer.*

2. *PIRÿMA*.

Calyx cylindric, bilabiate; upper lip longer, with 3 bristly teeth; lower lip 2-toothed. Corolla bilabiate; upper lip emarginate; the lower much larger, 3-lobed. Style slender. Stigma 2-lobed. Fruit oblong, 1-celled, 1-seeded. *Per.*

1. *P. leptostachya*. *Lopseed.*

Stem erect, slender, square, branching, pubescent; leaves ovate, coarsely serrate, thin and large, petiolate; lower ones on long petioles; flowers opposite, rather small, in very long, slender, axillary and terminal spikes; corolla light purple; pedicels of the fruit deflexed; seed solitary, inclosed in a thin pericarp, all invested by the closed calyx. A rather elegant plant, 1–3 ft. high, distinguished by its long, slender spikes and deflexed fruit. Common in rich woodlands. *July.*

ORDER LXXX. Labiatae.—*Labiata-family.*

A. Fertile Stamens 2.

* *Calyx-teeth nearly equal.*

3. *LYCOPUS*. Corolla with 4 nearly equal segments.

4. *MONARDA*. Corolla bilabiate; upper lip linear.

** *Calyx distinctly bilabiate.*

5. *SÁLYIA*. Upper lip of the corolla nearly or quite entire. Connective of each anther articulated transversely to the filament; each extremity supporting 1 anther cell.

10. *COLLINSÔNIA*. Upper lip of the corolla with 4 nearly equal lobes; lower lip fringed.

11. *HEDEÔMA*. Upper lip of the corolla emarginate.

B. Fertile Stamens 4, didynamous.

a. *Calyx distinctly bilabiate, with segments unequal in length.*

* *Stamens ascending under the upper lip of the corolla.*

12. *MELISSA*. Lips of the calyx toothed. Lower lip 3-lobed, the middle lobe entire. Filaments simple.

13. *SCUTELLARIA*. Lips of the calyx entire. Upper sepal vaulted, in fruit closing over the lower one like a lid.

14. *PERNÉLLA*. Middle segment of the 3-lobed lower lip, finely toothed. Filaments forked, the lower portion bearing the anther.

** *Stamens not included in the upper lip of the corolla.*

7. *THYMUS*. Calyx hairy in the throat. Upper lip of the corolla emarginate. Stamens slightly exsert.

23. *TRICHOSTÉMA*. Upper lip of the corolla 2-lobed. Stamens much exsert, curved upwards in a circle.

b. *Calyx-teeth 5, nearly equal in length.*

* *Stamens included beneath the upper lip of the corolla.*

15. *NÉPETA*. Corolla-tube expanded at the throat. Upper lip emarginate. Middle segment of the lower lip crenate.

17. *PHYSOTÉGIA*. Calyx inflated after flowering. Corolla-tube much exserted, inflated. Upper lip nearly erect, entire.

18. *LAMIUM*. Corolla-tube expanded at the throat. Upper lip vaulted, narrowed at base. Middle segment of the lower lip emarginate, contracted at base.

19. *LEONTÉUS*. Upper lip of the corolla oblong, somewhat arched, entire. Middle segment of the lower lip obovate.

20. *GÁLÉBÉIS*. Upper lip of the corolla ovate, arched, entire. Middle segment of the lower lip obovate, crenately toothed; the palate with 2, tooth-like processes on the upper side.

21. *STACHYS*. Upper lip of the corolla nearly erect. Middle segment of the lower lip nearly entire. Stamens projecting beyond the corolla-tube.

** *Stamens erect or ascending, not included in the upper lip of the corolla.*

2. *MÉNTHA*. Corolla with 4 nearly equal lobes. Stamens straight, nearly equal.

6. *PHYCÂNTHÉMUM*. Calyx about 18-nerved. Upper lip of the corolla flat, nearly or quite entire. Lower lip with 8 obtuse lobes. Flowers in dense, many-bracted whorls.

8. *SATURÉJA*. Calyx 10-ribbed. Lips of the corolla nearly equal. Flowers spicate, pink.

9. *HYSSOPUS*. Calyx about 15-ribbed. Upper lip of the corolla erect, flat, emarginate. Flowers spicate, blue.

16. *LOPHÁNTHUS*. Calyx 15-ribbed, obliquely 5-toothed. Upper lip of the corolla flat, emarginate. Stamens exsert; lower pair shorter than the upper pair.

24. *TEÚCRÍUM*. Corolla 5-lobed; 4 upper lobes nearly equal, declinate; lower lip roundish. Stamens exsert from the cleft between the 2 uppermost lobes of the corolla.

*** *Stamens declinate.*

1. *LAVÁNDULA*. Calyx with 5 similar teeth. Upper lip of the corolla 2-lobed; lower 3-lobed.

c. *Calyx-teeth 10.*

22. *MARRÛBIUM*. Calyx with 5 short teeth, alternating with 5 longer ones, all at length spiny.

1. *LAVÁNDULA*.

Calyx ovoid-cylindric, with 5 short teeth; the upper ones often the largest. Upper lip of the corolla 2-lobed; lower lip 3-lobed; lobes nearly equal. Stamens included. *Per.*

1. *L. spica*. *Lavender.*

Stem suffrutescent and branching at base; leaves linear-lanceolate, tapering at base, sessile, revolute on the margin, white-downy; the lower ones broader near the extremity; the uppermost becoming bracts, shorter than the calyx; flowers light purple, in interrupted spikes; calyx villous; corolla much exsert. A well-known plant, often cultivated for its powerfully aromatic and stimulant properties arising from the presence of a volatile oil, which is often used in medicine. Stem 10'–18' high. *July.*

2. *MÉNTHA*.

Calyx somewhat campanulate, with 5 nearly or quite equal teeth. Corolla with a short tube included in the calyx, nearly regular, 4-cleft; upper lobe broadest, entire or emarginate. Stamens 4, nearly equal, straight, distant. Achenia smooth. *Per.*

1. *M. Canadensis*. *Horsemint.*

Pubescent; stem low, ascending, simple or branching, pubescent with reversed hairs on the angles; leaves oblong, or oblong-lanceolate, serrate, petiolate, acute, tapering at base, on short, pubescent petioles; flowers small, pale purple, in dense, axillary, globular whorls; calyx hairy; stamens exsert. A plant of a grayish-green aspect, and a somewhat heavy, aromatic odor. Common in wet grounds and along brook-sides. Stem 1–2 ft. high. *July–Sept.*

2. *M. viridis*. *Spearmint.*

Root creeping; stem smooth, erect, with erect branches; leaves subsessile, ovate-lanceolate, acute, unequally serrate, smooth; flowers pale purple, in distinct, axillary whorls, arranged in slender, interrupted spikes; bracts setaceous; calyx-teeth somewhat hairy; style much exsert. A very common plant, much esteemed in domestic medicine. Stem 1–2 ft. high. Wet grounds. *July.*

3. *M. pipéríta*. *Peppermint.*

Smooth; stem purplish, erect, branching; leaves ovate or ovate-lanceolate, acute, serrate, petiolate, dark green; flowers purplish, in dense, aggregated whorls, forming compact spikes, interrupted below; bracts lanceolate. A well-known aromatic plant of still greater pungency, and of far more agreeable flavor than the last. Stem 2–3 ft. high. Often cultivated, and sometimes naturalized in wet grounds and along brooks. *July.*

3. *LYCOPUS*.

Calyx tubular, 4–5-toothed. Corolla campanulate, scarcely longer than the calyx, with 4 subequal lobes; upper segment broadest, emarginate. Stamens 2, distant, sometimes with 2 sterile rudiments of stamens. Style straight. Achenia smooth, with thickened margins. *Per.*

1. *L. sinuatus*. *Water Hoarhound.*

Smooth; stem sharply 4-angled, branching; leaves oblong-lanceolate, tapering at both ends, petiolate, sinuately-toothed; lowest pinnatifid; uppermost linear and nearly entire; flowers small, white, in dense, axillary whorls; calyx-teeth 5, spinescent, longer than the achenia. A light green herb, 10'–13' high, resembling the Mints, but distinguished by its entire want of fragrance. Common in low grounds. *Aug.*

2. *L. Virginicus.**Bugle Weed.*

Smooth; stem obtusely 4-angled, with concave sides, sending out runners from the base; leaves ovate-lanceolate, or oblong, coarsely-toothed, tapering and entire toward the base, on short petioles; flowers small, purplish-white, in few-flowered, axillary whorls; calyx-teeth 4, ovate, obtuse. Stem 10'—15' high. A species much resembling the last in general appearance. The whole plant frequently assumes a purple color. Not uncommon in low grounds. *July—Aug.*

4. *MONÁRDA.*

Calyx elongated, tubular, 15-nerved, subequally 5-toothed. Corolla tubular, with a somewhat inflated throat. Limb strongly 2-lipped; upper lip linear, erect; lower lip spreading, 3-lobed; middle lobe narrowest and slightly emarginate. Stamens 2, elongated, ascending beneath the upper lip, mostly exsert. Anthers linear. Cells divaricate at base, connate at apex. *Per.*

1. *M. didyma.**High Balm.*

Somewhat pubescent; stem erect, usually branching; leaves ovate, or ovate-lanceolate, acuminate, rounded or somewhat cordate at base, rough, on short petioles; bracts and uppermost leaves tinged with red; flowers in dense, terminal heads, from which other and smaller heads sometimes arise; calyx smooth, colored, nearly naked at the throat; corolla large and showy, smooth, very long, bright red or scarlet. A very elegant and showy plant, 2—3 ft. high, native of swamps in the more Northern States, frequent in cultivation. *July.*

2. *M. fistulosa.**Wild Bergamot.*

Nearly smooth, varying to downy; stem erect, solid, or more or less hollow, simple, or with a few opposite branches; leaves petiolate, ovate-lanceolate, rounded, or slightly hearted at base, acute or acuminate; flowers in a few, dense, terminal, many-flowered heads, surrounded by sessile bracts, the upper and outer of which are leafy and often colored; calyx very hairy at the throat; corolla pale purple, greenish-white, pale yellow, or rose-color, smooth or hairy. A very variable plant, assuming a great number of forms. Stem 2—4 ft. high. Not uncommon in woods, thickets, and rocky banks, especially in the Middle and Western States. *July—Sept.*

5. *SÁLVIA.*

Calyx campanulate, striate, bilabiate; upper lip 2—3-cleft; lower lip 2-cleft. Corolla deeply 2-lipped, ringent; upper lip straight, or slightly curved, mostly entire; lower lip spreading, 3-lobed. Stamens 2, with short filaments. Connective articulated transversely to the filament, supporting at each end a cell of the halved anther. *Per.*

1. *S. officinalis.**Sage.*

Stem low, shrubby; leaves ovate-lanceolate, crenulate, of a dull, grayish-green; flowers in few-flowered whorls, arranged in spikes; calyx-teeth mucronate, viscid; corolla blue, ringent, with an elongated tube; upper lip as long as the lower, and somewhat vaulted. A very common garden plant, highly esteemed for its peculiar aromatic properties. *July.*

6. *PHYCÁNTHUM.*

Calyx more or less tubular, about 13-nerved, 5-toothed. Corolla bilabiate, with a short tube; upper lip nearly flat, and almost or quite entire; lower lip with 3 ovate, obtuse lobes. Stamens distant. Anther-cells parallel. *Per.*

1. *P. incanum.**Mountain Mint.*

Stem erect, obtusely 4-angled, white-downy, with a few opposite branches; leaves oblong-ovate, remotely toothed, acute, downy above, hoary beneath, on short, downy petioles; uppermost whitish on both sides; flowers in dense whorls, forming loose, compound cymes or heads, which are surrounded by numerous bracts, and supported on white, downy peduncles; inner bracts setaceous, tipped with a bristle at the end; outer ones lanceolate; corolla flesh-color or pale purple; the lower lip spotted with dark purple; calyx bilabiate, the 3 upper segments being united and bearded at the extremity. An aromatic, very woolly plant, 2—3 ft. high, common in rocky, hilly woods. *July—Aug.*

2. *P. mūticum.**Wild Basil.*

Smooth or slightly hairy; stem erect, corymbosely branching, pubescent on the angles; leaves ovate, or ovate-lanceolate, acute, rounded or somewhat cordate at base, nearly or quite sessile, usually with a few small teeth; uppermost hoary, with a soft, short pubescence; flowers in dense, axillary and terminal, bracted whorls; bracts white-downy, lanceolate or subulate, awned; calyx-teeth

triangular-ovate, white-downy; corolla purplish-white, spotted, especially the lower lip, with brownish-purple. A common species, in dry woods and fields, possessing a pleasant, Mint-like flavor and smell. *Aug.*

3. *P. lanceolatum.* *Narrow-leaved Wild Basil.*

Smooth or slightly downy; stem erect, pubescent on the angles, very branching, leafy; leaves lanceolate, varying to linear, acute, entire, obtuse at base, sessile, often with axillary fascicles of leaves or branchlets; flowers in dense heads, forming a terminal corymb; bracts ovate-lanceolate, acuminate, white-downy; calyx-teeth short, triangular, white-downy; corolla pale purplish-white, spotted with brownish-purple. A very common species, 1—3 ft. high, possessing the same aromatic properties as the preceding one. Thickets and fields. *July—Aug.*

7. *THÏMUS.*

Calyx bilabiate, about 13-nerved, hairy in the throat; upper lip 3-toothed; lower lip 2-cleft, with subulate, ciliate divisions. Corolla short, somewhat 2-lipped; upper lip flattish, emarginate; lower lip spreading, with 3 nearly equal teeth. Stamens 4, distant, mostly exsert.

1. *T. vulgaris.**Thyme.*

Stems decumbent at base, ascending, suffrutescent, branching, tufted; leaves oblong-ovate, or lanceolate, entire, velvety, revolute on the margins; flowers in whorls, arranged so as to form terminal, leafy spikes; corolla purplish. A culinary herb, frequently cultivated for its highly aromatic properties. *June—Aug. Bien.*

2. *T. Serpyllum.**Mother of Thyme.*

Stems decumbent at base, ascending, suffrutescent, wiry, branching, slender, leafy, downy above, tufted; leaves ovate, obtuse, entire, on short petioles, more or less ciliate, punctate; flowers in dense, oblong heads terminating the branches; corolla purple, spotted. A species equally aromatic with the last, frequent in cultivation, sometimes naturalized. *June—July. Per.*

8. *SATURĖJA.*

Calyx tubular, 10-nerved. Corolla bilabiate. Lips nearly equal. Stamens diverging, scarcely exsert. *An.*

1. *S. hortensis.**Summer Savory.*

Stem branching, bushy, woody at base, often changing to purple; leaves numerous, oblong-linear, entire, acute, small and narrow; flowers light purple or pink, in axillary cymes; calyx nearly as long as the corolla. An aromatic pot-herb, common in gardens. Stem 10'—18' high. *July—Aug.*

9. *HYSSOPUS.*

Corolla bilabiate; upper lip erect, flat, emarginate; lower lip 3-parted; tube about as long as the calyx. *Per.*

1. *H. officinalis.**Hyssop.*

Stems erect, tufted; leaves linear-lanceolate, acute, entire, sessile; flowers in racemose one-sided verticils, bright blue; calyx-teeth erect; middle segment of the lower lip of the corolla 2-lobed. A handsome plant, frequently cultivated in gardens for its medicinal properties. Stem 2 ft. high. *July.*

10. *COLLINSŌNIA.*

Calyx bilabiate, declinate in fruit; upper lip truncate, 3-toothed; lower lip 2-toothed. Corolla exsert, expanded above, somewhat bilabiate; upper lip with 4 nearly equal lobes; lower lip longer, declinate, lacerately-fringed. Stamens 2, rarely wanting, much exsert, diverging. *Per.*

1. *C. Canadensis.**Horse-Balm.*

Nearly or quite smooth; stem erect, square, branching; leaves ovate, coarsely serrate, on long petioles, acuminate; flowers rather large, in racemes, forming a terminal panicle; corolla pale yellow, with a conspicuously fringed lower lip; calyx-teeth subulate, shorter than the tube; style and stamens very long. A tall, rather coarse herb, 3—5 ft. high, slightly fragrant, common in damp, rich soils. *July—Sept.*

11. *HEDĖOMA.*

Calyx nearly tubular, gibbous at base, 13-ribbed, bilabiate; upper lip 3-toothed; lower 2-toothed; throat hairy. Corolla bilabiate; upper lip flat, erect, emarginate; lower lip spreading, 3-lobed; lobes nearly equal. Stamens 2, sometimes accompanied by 2 sterile filaments. *An.*

1. *H. pulegioides*.*Pennyroyal.*

Pubescent; stem erect, branching; leaves ovate, or oblong-ovate, few-toothed, on short petioles, smooth above, somewhat rough beneath; flowers small, pale purple, in axillary whorls; corolla pubescent, scarcely longer than the ciliate calyx. A low, fragrant plant, of great repute in domestic treatment. Common in dry, barren fields and pastures. Stem 3'—8' high. *July—Sept.*

12. *MELISSA.*

Calyx 13-ribbed, flattish above; upper lip 3-toothed; lower lip 2-toothed. Corolla bilabiate; tube curved backwards and ascending; upper lip erect, flattish; lower lip spreading, 3-lobed; middle lobe broadest. Stamens ascending. *Per.*

1. *M. officinalis.**Balm.*

Pubescent; stem erect, branching; leaves ovate, acute, coarsely and crenately toothed, rugose; flowers subsessile in half whorls, white or yellow; bracts few, ovate-lanceolate, petiolate. A well-known garden plant, 1—2 ft. high, cultivated for its medicinal properties. Rarely naturalized. *June—Aug.*

13. *SCUTELLARIA.*

Calyx campanulate, bilabiate, gibbous; lips entire; upper sepal arched, closing the lower lip like a lid after flowering. Corolla bilabiate, with the tube elongated, dilated above; upper lip arched, nearly or quite entire; lower lip with its middle lobe dilated and convex. Stamens 4, ascending beneath the upper lip. Anthers approximate in pairs, ciliate. *Per.*

1. *S. galericulata.**Common Skullcap.*

Smooth, rarely slightly pubescent; stem simple or slightly branched; leaves all alike, ovate, or ovate-lanceolate, acute, serrate, more or less cordate at base, on very short petioles, almost sessile; flowers large, axillary, usually solitary; corolla blue, greatly expanded above. A handsome plant with large blue flowers. Common in swamps and meadows. Stem 1—2 ft. high. *Aug.*

2. *S. lateriflora.**Side-flowering Skullcap.*

Smooth; stem erect, with opposite branches; leaves ovate-lanceolate, coarsely serrate, acuminate, petiolate; lower floral leaves resembling the others; upper floral leaves small, resembling bracts; flowers small, in lateral, axillary, leafy, long-peduncled, somewhat one-sided racemes; corolla blue. A smaller and more bushy plant than the last. Common in meadows and low grounds. Stem 10'—18' high. *July—Aug.*

14. *PRUNELLA.*

Calyx tubular-campanulate, about 10-ribbed, bilabiate, closed in fruit; upper lip broad and flat, with 3 short teeth; lower with 2 lanceolate teeth. Corolla somewhat contracted at the throat, bilabiate; upper lip vaulted, erect, entire; lower lip spreading, reflexed, 3-cleft; middle lobe rounded, concave, finely toothed. Stamens 4, ascending beneath the upper lip. Filaments forked, the lower division bearing the anther. *Per.*

1. *P. vulgaris.**Selfheal.*

Stem low, simple, or slightly branched, often decumbent at base, marked with pubescent lines; leaves oblong-ovate, entire, or slightly toothed, petiolate; flowers in dense, sessile, bracted, 5—6 flowered verticils, forming a dense terminal spike; bracts reniform, 2 to each verticil, membranous, ciliate; corolla blue or violet of various shades. A common plant, 6'—12' high, in meadows and low grounds. *June—Aug.*

15. *NÉPETA.*

Calyx tubular, obliquely 5-toothed. Corolla naked and expanded at the throat, bilabiate; upper lip erect, emarginate; lower lip spreading, 3-cleft, middle lobe crenate. Stamens 4, ascending beneath the upper lip, approximate in pairs. *Per.*

1. *N. Catária.**Catnip.*

Downy; stem tall, erect, branching; leaves cordate, petiolate, crenate, soft and velvety, white-downy beneath; flowers in slightly pedunculate whorls, arranged in interrupted spikes; corolla purplish-white, twice as long as the calyx; lower lip dotted with purple. A naturalized plant, possessing a powerful odor, extremely attractive to cats. Common in waste places. Stem 3—4 ft. high. *July.*

2. *N. Gléchoma. Gill-run-over-the-ground.*
Ground Ivy.

More or less hairy; stem creeping, rooting at base; leaves reniform, crenate, petiolate, glaucous-green; flowers 3—5 together, in loose, axillary clusters; co-

rolla light blue, variegated at the throat, about 3 times as long as the calyx; anther-cells diverging at a right angle, so that the approximate cells of each pair present the appearance of a cross. A creeping, aromatic plant, naturalized in waste grounds. Stem 1—2 ft. long. *May—Aug.*

16. *LOPHÁNTHUS.*

Calyx tubular-campanulate, 15-ribbed, oblique, 5-toothed; upper teeth the longest. Corolla bilabiate; upper lip nearly erect, emarginate; lower lip somewhat spreading, 3-lobed; middle lobe crenate. Stamens 4, exsert, diverging. *Per.*

1. *L. nepetoides.**Great Hyssop.*

Smooth, or nearly so; stem square, with acute angles; leaves ovate, sharply serrate, petiolate; flowers in dense axillary verticils; calyx-teeth ovate, obtusish, slightly shorter than the pale, yellowish-green corolla. A tall, green herb, rather common on the borders of woods, in the Middle States and Westward, sometimes found in W. N. Eng. Stem 3—6 ft. high. *July—Aug.*

17. *PHYSOSTÉGIA.*

Calyx campanulate, with 5 nearly equal teeth, inflated after flowering. Corolla much exserted, with the throat inflated; upper lip nearly erect, entire; lower lip spreading, 3-parted; middle lobe broad and rounded, emarginate. Stamens 4, ascending beneath the upper lip. *Per.*

1. *P. Virginiana.**Lion's Heart.*

Smooth; stem erect, thick and rigid; leaves lanceolate-ovate, varying to linear-lanceolate, sessile, serrate, with remote, shallow teeth, dark green; flowers large, showy, in dense, terminal, 4-rowed spikes, with subulate bracts; corolla pale purple or flesh-color, spotted inside. A beautiful plant, native in Penn. and the West, frequent in cultivation. Stem 1—3 ft. high. *July—Sep.*

18. *LAMIUM.*

Calyx tubular-campanulate, about 5-ribbed, with 5 nearly equal teeth. Corolla dilated at throat, bilabiate; upper lip vaulted, narrowed at base; lower lip 3-parted; middle lobe broad, emarginate, contracted at base; lateral lobes small, attached to the margin of the throat. Stamens 4, ascending beneath the upper lip. *An.*

1. *L. amplexicaule.**Henbit.*

Stems decumbent at base, several from the same root; leaves broad, nearly round, hairy; lower ones small, on long petioles; cauline ones cordate, doubly crenate, much larger; floral leaves similar, but nearly or quite sessile; flowers in dense verticils, sessile in the axils of the upper leaves; lower whorls remote; upper ones crowded; calyx hairy; corolla light purple, elongated; upper lip downy; lower lip spotted. A slender plant, 5'—18' high, not uncommon in waste and cultivated grounds. *May—Oct.*

19. *LEONÓRUS.*

Calyx turbinate, 5-ribbed, with 5 subequal subulate teeth, somewhat spiny when old. Corolla bilabiate; upper lip erect, oblong, entire, hairy; lower lip 3-lobed, spreading; middle lobe obovate. Stamens 4, ascending beneath the upper lip. *Per.*

1. *L. Cardiaca.**Motherwort.*

Pubescent; stem erect, branching, often purplish; leaves on long petioles; lower ones rounded at base, palmately lobed; floral leaves trifid, cuneiform at base, with lanceolate lobes; all variously toothed and arranged in 4 rows on the stem; flowers in dense, axillary whorls; corolla purplish, hairy outside, variegated inside; the tube longer than the calyx, with a hairy ring within. A tall weed, 3—5 ft. high, common around rubbish and in waste places. *July—Sep.*

20. *GALEÓPSIS.*

Calyx tubular-campanulate, 5-ribbed, with 5 subequal, spinescent teeth. Corolla bilabiate, dilated at the throat; upper lip ovate, arched, mostly entire; lower lip 3-cleft, spreading; middle lobe obovate, toothed and crenate; the palate with 2 teeth on the upper side. Stamens 4, ascending beneath the upper lip. *An.*

1. *G. Tétrahit.**Hemp Nettle.*

Stem hispid, swollen below the joints; leaves ovate, coarsely serrate, hispid, acute; flowers in dense, axillary verticils; corolla purple, variegated with white, 2—3 times as long as the calyx. A weed in waste places, common in some districts. Stem 1—2 ft. high. *June—July.*

21. *STÁCHYS.*

Calyx tubular-campanulate, angular, 5—10 ribbed, 5-toothed;

upper teeth often larger, and more or less united. Corolla bilabiate; upper lip erect, spreading or arched, entire or nearly so; lower lip spreading, usually longer than the other, 3-lobed; middle lobe nearly entire. Stamens 4, ascending beneath the lower lip. Anthers approximate in pairs. *Per.*

1. *S. áspera.* *Hedge Nettle. Woundwort.*

Stem erect, nearly simple, clothed with stiff, deflexed bristles, especially on the angles; leaves ovate-lanceolate or oblong-lanceolate, acute, serrate, bristly, especially on the mid-rib and veins, rounded at base, on short petioles; flowers about 6 in a whorl, arranged in spikes; calyx with bristly, at length, spinescent teeth; corolla pale purple. A coarse, rough plant, 1—3 ft. high, not uncommon in swamps and meadows. *July.*

22. *MARRUBIUM.*

Calyx tubular, 5—10-ribbed, with 5—10 nearly equal teeth, at length more or less spiny, and spreading at maturity. Corolla bilabiate; upper lip erect, flattish, emarginate; lower lip spreading, 3-cleft. Stamens 4, included in the corolla-tube. *Per.*

1. *M. vulgäre.* *Hoarhound.*

Stem ascending, white-downy; leaves roundish-ovate, crenately toothed, petiolate, white-downy beneath; flowers in dense, hairy, axillary whorls; calyx-teeth 10, recurved; alternate ones shorter; corolla small, white. A bitter aromatic herb, rather frequent in waste grounds. Introduced. Stem 1—2 ft. high. *Aug.*

23. *TRICHOSTEMA.*

Calyx campanulate, oblique, deeply and unequally 5-toothed; upper lip (which at length appears to be the lower lip by the twisting of the pedicel) with 3 nearly equal teeth, twice as long as the 2 very short teeth of the other lip. Corolla with a very short tube, unequally 5-lobed; lobes oblong, declined; the 3 lower more or less united and forming a lower lip. Stamens 4, much exserted, declinate near the base, and then curved upwards in a circle. *An.*

1. *T. dichótoma.* *Blue Curls.*

Stem erect, dichotomously branching, hairy; leaves oblong-lanceolate, or rhombic-lanceolate, sometimes linear-lanceolate, tapering at base, obtuse, entire, hairy; flowers axillary and terminal, on slender, 1-flowered pedicels, becoming inverted by the twisting of their stalks; corolla small, bright blue; stamens very long, much exserted, bright blue, very conspicuous, curving from the lower lip to the upper. A bushy, hairy plant, of a grayish appearance, 6'—8' high. Common in dry pastures and sandy fields. *Aug.*

24. *TEUCRUM.*

Calyx subcampanulate, subequally 5-toothed. Corolla 5-lobed; 4 upper lobes nearly equal, oblong, declined; lower lip roundish, larger. Stamens 4, exserted from the cleft between the 2 upper lobes of the corolla. *Per.*

1. *T. Canadense.* *Wild Germander.*

Downy; stem simple or branching, erect; leaves ovate-lanceolate, serrate, rounded at base, on short petioles, white-downy beneath; floral leaves scarcely longer than the calyx; flowers about 6 in a whorl, crowded into long, virgate spikes; corolla light purple, apparently destitute of any upper lip, on account of the declinate upper lobes. Stem 1—3 ft. high. Not uncommon in low grounds, especially near the sea-coast. *July.*

ORDER LXXXI. Boraginaceæ.—*Borage-family.*

SYNOPSIS OF THE GENERA.

* *Achenia armed with hooked prickles.*

7. *ECHINOSPERMUM.* Corolla salver-form, closed at the throat by 5 concave scales. Flowers blue.

8. *CYNOLÖSSUM.* Corolla funnel-form, closed at the throat by 5 convex scales.

** *Achenia not prickly, excavated at base.*

1. *BORAGO.* Corolla rotate.

2. *SYMPHYTUM.* Corolla tubular-campanulate, closed at the throat by 5 subulate scales.

*** *Achenia neither prickly nor excavated at base.*

3. *LITHOSPÉRMUM.* Corolla funnel-form, nearly salver-form, open at the throat, with a short tube scarcely exceeding the calyx.

4. *MERTÉNSIA.* Corolla funnel-form, naked in the throat, with 5 folds alternating with the stamens; tube much longer than the short calyx.

5. *PULMONÁRIA.* Corolla funnel-form, open at the throat, with 5 hairy lines alternating with the stamens; tube equalling the calyx.

6. *MYOSÓTIS.* Corolla salver-form, with a tube equalling the calyx, closed at the throat by 5 concave scales.

1. *BORAGO.*

Calyx 5-parted. Corolla rotate, 5-cleft; segments acute; tube with a crown at throat. Filaments converging. Achenia rounded, with a perforation at base, inserted lengthwise into the excavated receptacle. *An.*

1. *B. officinális.* *Borage*

Rough with scattered bristles; stem erect, branching; leaves ovate; lower with short petioles; upper sessile; flowers large, in nodding, terminal racemes, sky-blue; calyx spreading. A rough exotic, 2 ft. high. Common in gardens. *June—Sep.*

2. *SYMPHYTUM.*

Calyx 5-parted. Corolla tubular-campanulate, inflated above, 5-parted; segments short, spreading; orifice of the tube closed by 5, converging, subulate scales. Stamens included in the corolla. Style filiform. Achenia smooth, ovate, perforated at base. *Per.*

1. *S. officinále.* *Comfrey.*

Hairy; stem erect, branching above; lower leaves petiolate, ovate-lanceolate; upper ones decurrent, lanceolate; flowers in terminal, 1-sided, nodding racemes; corolla yellowish white, occasionally pink or red; sepals lanceolate, acuminate. A tall, coarse plant, 3—5 ft. high, cultivated for its mucilaginous root. Sometimes naturalized in low grounds and road-sides. *June—Aug.*

3. *LITHOSPÉRMUM.*

Calyx 5-parted, persistent. Corolla funnel-form, rarely salver-form; limb 5-lobed; throat open at the orifice, mostly with 5 small folds or projections. Stamens included in the corolla. Anthers oblong, almost sessile. Stigma obtuse, hispid. Achenia smooth or rugose, attached to the receptacle by a truncate base.

1. *L. arvensis.* *Gromwell.*

Pilose; stem erect, slender, with a few branches; leaves lanceolate, or linear-lanceolate, sessile, entire, nearly veinless, obtuse or acutish; flowers axillary, in nodding racemes, which become erect and elongated as they bloom; lower flowers remote; calyx nearly or quite equal to the white corolla. A rough plant, with a thick reddish root. Common in dry grounds. Stem 6'—12' high. *June—July. An.*

4. *MERTÉNSIA.*

Calyx 5-parted. Corolla-tube cylindric, expanding towards the top, much longer than the calyx, naked, or with 5 folds or ridges in the open throat; limb 5-lobed. Stamens inserted at the top of the tube. Style long, filiform. Achenia smooth or somewhat wrinkled. *Per.*

1. *M. Virginica.* *Virginian Lungwort.*

Smooth; stem erect, simple; radical leaves obovate; cauline leaves ovate; uppermost lanceolate, all entire, pale green, somewhat glaucous; flowers large, handsome, in terminal racemes, destitute of bracts, except 1—2 leaves at base; corolla of a brilliant purplish blue, rarely white; limb longer than the tube; stamens and style included. An elegant plant with handsome foliage, distinguished by its very large radical leaves. Native in rich woods in W. N. York, and thence westward. Sometimes cultivated. Stem 10'—20' high. *May.*

5. *PULMONÁRIA.*

Calyx prismatic, 5-angled, 5-toothed. Corolla funnel-form, with a cylindric tube; orifice with 5 hairy lines, alternating with the stamens.

1. *P. officinális.* *Lungwort.*

Rough; stem erect, simple; radical leaves ovate-cordate; cauline leaves ovate, sessile; flowers blue, in terminal racemes; calyx as long as the corolla-tube. A rough exotic, about a foot high, frequent in gardens. *May. Per.*

6. *MYOSÓTIS.*

Calyx 5-cleft. Corolla salver-form; tube about as long as the calyx; limb 5-lobed; lobes slightly emarginate; throat with 5 short, concave scales. Achenia ovate, smooth, flattened, attached at base by a minute scar.

1. *M. láxa.**Forget-me-not.*

Nearly smooth; stem ascending, rooting near the base, somewhat branching; leaves linear-oblong, obtuse, clothed with short, scattered, appressed hairs; flowers small, arranged in long, bractless, 1-sided racemes; pedicels filiform, longer than the flowers, spreading in fruit; calyx in 5 short, spreading segments, open in fruit, and sprinkled with simple, appressed hairs; corolla light-blue, yellowish at the centre; style very short. A common plant in wet grounds, 6'—12' high. *June—Sep. Bien.*

2. *M. stricta.**Mouse-ear.*

Hairy; stem low, erect, very branching above; leaves oblong, obtuse, sessile; lowest oblanceolate, tapering to a short petiole; flowers in terminal racemes, which are leafy at base, at first very short, but afterwards elongated; pedicels erect in fruit, shorter than the calyx; corolla very small, white, rarely bluish; tube included in the calyx, which is closed in fruit, and clothed with spreading hairs. A little plant, 3'—10' high, of a grayish aspect, quite variable in size and appearance. Common in dry soils in the more northern States. *May—July. An.*

7. ECHINOSPÉRMUM.

Calyx 5-parted. Corolla salver-form, short, closed at the throat by 5 short, concave scales. Achenia compressed or triangular, armed on the back with several rows of barbed prickles. *An.*

1. *E. Láppula.**Burr-seed.*

Rough-hairy; stem erect, very branching above; leaves lanceolate, or linear-lanceolate, sessile, ciliate; flowers small, blue, in bracted racemes; pedicels short, erect; corolla longer than the calyx; achenia with 2 rows of hooked prickles on the margin. A grayish, homely herb, 1—2 ft. high, common in waste places in some districts. *July.*

8. CYNOLÓSSUM.

Calyx 5-parted. Corolla funnel-form, with a short tube, about as long as the calyx, closed at the throat by 5 converging, convex, obtuse scales. Achenia depressed, affixed laterally to the base of the style, covered with short, hooked prickles.

1. *C. officinále.**Hounds-tongue.*

Whole plant clothed with a soft, silky pubescence; stem erect, simple, or somewhat branching, leafy; leaves lanceolate, acute; lower ones tapering to a winged petiole; upper ones clasping with a rounded base; all entire; flowers rather large, in nearly bractless racemes, arranged in terminal panicles; corolla dull red or purplish. A common weed, distinguished by its dull green, homely appearance, and its extremely disagreeable odor. Stem 1—2 ft. high. Road-sides and waste places. *July. Per.*

2. *C. Morrisoni.**Virginian Mouse-ear.*

Hairy; stem erect, very branching above, leafy; leaves oblong-ovate, acuminate, tapering at base, remote, entire, thin, rough above; flowers very small, in leafy, bracteate, divaricately forking racemes at the extremities of the slender, spreading branches; pedicels nodding in fruit; corolla minute, white, rarely tinged with blue; achenia convex, densely clothed with hooked prickles. A hairy weed, common in thickets and rocky places. Stem 2—4 ft. high. *July. An.*

ORDER LXXXII. Hydrophyllaceæ.—
Waterleaf-family.

1. HYDROPHÝLLUM.

Calyx 5-parted. Corolla campanulate, 5-parted, with 5 longitudinal, linear, margined appendages on the inside corresponding to the lobes, and forming 5, nectariferous grooves. Stamens exsert. Filaments more or less bearded. Ovary clothed with bristles, spherical, 2-celled, 2-valved, 4-ovuled, in fruit usually ripening but 1 seed. *Per.*

1. *H. Virginicum.* *Burrflower.* *Virginian Water-leaf.*

Smoothish; stem erect, mostly simple; leaves pinnately parted into 5—7 segments, which are oval-lanceolate or oblong, acuminate, incisely serrate; lowest usually 2-lobed; uppermost confluent; petioles long and clasping; flowers in dense heads; peduncles as long as the petioles; calyx-teeth narrow-linear, cili-

ate with long bristles; corolla pale blue, sometimes whitish; stamens and style exsert, twice as long as the corolla. An elegant herb, 3'—15' high, common in rich, moist woods in N. and W. N. Eng. and N. York. *June.*

1. *H. Canadense.**Canadian Water-leaf.*

Nearly smooth; stem erect; leaves large, palmately 5—7-lobed, rounded or cordate at base, unequally toothed, somewhat rough; flowers in dense heads on cordate peduncles, much shorter than the petioles; pedicels very short; calyx-teeth linear-subulate, nearly smooth; corolla white, much tinged with purple; stamens and style much exsert. A less elegant and coarser species than the last, 10'—15' high, common in rich, moist woods, in the same districts as the last. *June—July.*

ORDER LXXXIII. Polemoniaceæ.—*Phlox-tribe.*

1. PHLÓX.

Calyx somewhat prismatic, deeply 5-cleft. Corolla salver-form, with the slender tube more or less curved. Stamens very unequal, inserted in the corolla-tube above the middle. Capsule ovoid, 3-celled; cells 1-seeded. *Per. except No. 4.*

1. *P. paniculata.**Phlox. Flora's Bouquet.*

Smooth; stem erect, tall; leaves oblong-lanceolate, or oval-lanceolate, acuminate, tapering at base; upper ones sometimes cordate at base; flowers in numerous corymbs arranged in a terminal, very showy, somewhat pyramidal panicle; calyx-teeth tipped with a setaceous point, shorter than the tube; corolla purple, pink, red, or even white, scentless; lobes entire. A native of Penn., and thence southward and westward. Very common in gardens. *VAR. ACUMINATA* differs in having broader leaves, which are sometimes downy beneath, and the stem sometimes rough-hairy, and is altogether a smoother plant. Stem 2—3 ft. high. *July—Sep.*

2. *P. maculata.**Spotted Phlox.*

Mostly smooth; stem erect, slender, simple, spotted with purple; lower leaves lanceolate; upper leaves nearly ovate-lanceolate, rounded or cordate at base; flowers in large, elongated, oblong, terminal panicles, which are leafy below and sometimes nearly pyramidal; calyx-teeth triangular-lanceolate, acute, short; corolla purple, varying to white or scarlet; lobes entire. A beautiful southern and western species, 2—3 ft. high, very common in gardens. *June.*

3. *P. divaricata.**Early Phlox.*

Low, diffuse, covered with minute down; stems branching at base into a few, weak, ascending flowering-branches; leaves oblong-lanceolate, ovate-lanceolate, or lanceolate, acute; lower ones tapering at base; upper ones broad and clasping at base; floral leaves narrow-linear; flowers in terminal, loose corymbs; pedicels diverging, longer than the calyx; segments of the calyx linear-subulate, pubescent; corolla bright bluish-purple, with a peculiar grayish tinge, varying to a pale lilac-color; lobes obcordate. A very pretty species, with stems 1—2 ft. long, found in damp woods from N. Y., westward and southward. *May.*

1. *P. Drummondii.**Drummond's Phlox.*

Plant clothed with rough, glandular hairs; stem erect, dichotomously branching; leaves oblong or lanceolate, rough; flowers very showy, in dense, terminal cymes; calyx hairy; segments elongated, revolute, lanceolate, tapering to setaceous points; corolla of all possible hues, varying from white to dark purple; tube pilose; lobes ovate, entire. A splendid species, common in gardens, where there are numerous varieties. Stem 3'—12' high. *An.*

5. *P. subulata.**Dwarf Phlox.*

Stems procumbent, tufted, clothed with minute down, very branching; leaves rigid, subulate, or very narrowly linear, small, crowded, with fascicles of smaller ones in their axils; cymes few-flowered; calyx-teeth subulate, very acute; corolla pink or rose-color, rarely white; lobes cuneate, emarginate. A pretty, dwarf species, native in N. J., Penn., and Southward, frequent in gardens. *May.*

2. GÍLLIA.

Calyx 5-cleft; segments acute. Corolla-tube long or short; limb regularly 5-lobed. Stamens 5, equal, inserted at the top of the tube. Capsule oblong or ovoid, few—many-seeded.

1. *G. tricolor.**Three-colored Gilia.*

Stem erect, nearly smooth; leaves alternate, twice and thrice pinnatifid; segments narrowly-linear; flowers 3—6 together, in cymes, arranged in panicles, bractless; corolla 2—3 times as long as the calyx, of 3 colors; the limb pale-blue, tinged with pink; the throat purple; the tube yellow, very short, included in the calyx. An elegant garden annual, about a foot high.

3. *POLEMONIUM.*

Calyx campanulate, 5-cleft. Corolla rotate-campanulate, 5-lobed, erect; tube very short. Stamens equally inserted at the summit of the corolla tube. Filaments furnished with hairy appendages at base. Cells of the capsule few, many-seeded. *Per.*

1. *P. cœruleum.**Greek Valerian.*

Stems stout, clustered, smooth, simple, erect, hollow; leaves mostly radical, alternate, in long, channelled petioles, pinnately parted into 11—17 divisions; segments sessile, ovate-lanceolate, nearly opposite, acuminate; odd one lanceolate; flowers erect, in a terminal, corymbose panicle; calyx as long as the corolla-tube; corolla blue, rather large. An elegant garden plant, 1—2 ft. high, common in cultivation. *June.*

ORDER LXXXV. *Convolvulaceæ.—Morning-glory-tribe.*

SYNOPSIS OF THE GENERA.

SUBORDER I. *Convolvulææ.*

Seeds with large cotyledons. Herbaceous, usually climbing plants with green foliage.

1. *CONVOLVULUS.* Calyx without bracts at base. Stamens included.
2. *CALYSTËGIA.* Calyx with 2 large, leafy bracts at base.
3. *QUAMOCLIT.* Sepals 5, usually mucronate. Stamens exsert.

SUBORDER II. *Cuscutinææ.*

Seeds without cotyledons. Twining, parasitic plants, destitute of green herbage, all included in 4. *CUSCUTA.*

1. *CONVOLVULUS.*

Calyx 5-parted, naked. Corolla campanulate, funnel-form; limb with 5 plaits, and the border entire, or 5-lobed. Stamens included in the corolla, rarely slightly longer than the limb. Style 1, often 2-cleft at apex. Capsule 2—4-celled, 4—6-seeded.

1. *C. purpureus.* *Common Morning-glory.*

Stem twining, rough with reflexed hairs; leaves cordate, entire; peduncles elongated, 2—5-flowered; pedicels thickened; sepals hispid, ovate-lanceolate, acute; corolla funnel-form, large, 2' long, with a spreading, entire border; color varying from dark purple to pale flesh-color, in each case striped with various shades. A common climber, cultivated every where, and sometimes springing up spontaneously around houses and gardens. The flowers open at sunrise and close early in the forenoon. *June—Sep. An.*

2. *C. Batatas.**Sweet Potato.*

Stem terete, prostrate and creeping, rarely twining, hispid; leaves cordate-hastate, angular, 5-veined, nearly or quite smooth; flowers large, purple or white, in long peduncled fascicles; sepals lanceolate, acuminate. The common Sweet Potato cultivated largely in the Southern and Middle States. The tubers are thickened portions of its creeping rhizoma, or thickened off-shoots from it.

2. *CALYSTËGIA.*

Calyx 5-parted, included in 2 large, leafy bracts. Corolla funnel-form, varying to campanulate, with 5 plaits or folds; the limb entire or obscurely 5-lobed. Stamens nearly equal, shorter than the limb. Style 1. Stigmas 2. Ovary imperfectly 2—4-celled. Capsule 1-celled, 4-seeded. *Per.*

1. *C. Sèpium.**Wild Morning-glory.*

Stem twining, mostly smooth; leaves sagittate, acuminate; lobes truncate, and often toothed at base; peduncles sharply 4-angled, 1-flowered; bracts cordate, much longer than the concealed calyx; flowers large, 2' long, white, varying to pale rose-color, opening before sunrise and closing early in the day, except in cloudy weather. A common, rank climber, in low, damp thickets. Stem 5—10 ft. long. A variety occurs on sandy shores, with prostrate, not climbing, more or less pubescent stems. *June—July Per.*

3. *QUAMOCLIT.*

Sepals 5, mostly mucronate. Corolla tubular cylindric. Stamens exsert. Style 1. Stigma capitate, 2-lobed. Ovary 4-celled; cells 1-seeded. *An.*

1. *Q. vulgaris.**Cypress Vine.*

Smooth; stem very slender, twining; leaves deeply pinnatifid; segments linear, parallel, acute; peduncles 1-flowered; flowers small, brilliant, scarlet, varying to crimson and rose-color; sepals ovate-lanceolate. An extremely delicate and beautiful plant, native in the South, frequent in cultivation. *July—Aug.*

4. *CUSCUTA.*

Calyx 5, rarely 4-cleft. Corolla globose-campanulate; border spreading, 5, rarely 4-cleft. Stamens 5, rarely 4, inserted into the tube of the corolla with a scale-like appendage at base. Stigmas 2. Capsule 2-celled; cells 2-seeded. *An.*

1. *C. Gronövii.**Dodder.*

Plant leafless, parasitic, destitute of all verdure; stem filiform, orange-yellow; flowers sessile, in dense clusters, white; corolla campanulate, withering at the base of the globose capsule; scales of the stamens large and much fringed. An exceedingly delicate, parasitic vine, destitute of all green color. The seed germinates in the soil, and at first the plant draws thence its whole sustenance, but afterwards, climbing over other plants, it supports itself from their juices, which it absorbs by means of little radicles, while it withers away at base, and soon loses all direct communication with the ground, and becomes entirely parasitic. The yellowish-white flowers grow in large, dense clusters, which are sometimes found alone, the stems having entirely withered away. The stem twines from right to left. *July—Sep.*

ORDER LXXXVI. *Solanaceæ.—Potato-tribe.*

SYNOPSIS OF THE GENERA.

* *Corolla with a proper tube.*

1. *PETÛNIA.* Calyx-tube short; limb with 5 leafy lobes. Corolla salverform, with 5 unequal lobes.
2. *NICOTIÂNÀ.* Calyx tubular. Corolla funnel-form, with 5 equal lobes. Capsule not prickly.
3. *DATÛRA.* Calyx tubular, inflated. Corolla funnel-form, 5-angled, scarcely lobed. Fruit prickly.
4. *LYCICH.* Calyx short. Corolla tubular, closed at the throat by the bearded filaments. Stamens exsert. Trailing or climbing shrubs.

* *Corolla with a very short tube, or none at all.*

4. *NICANDRA.* Calyx 5-cleft, with 5 compressed angles, enlarged and bladder-like in fruit, inclosing the 3—5-celled berry. Corolla campanulate, blue.
5. *PHYSLIS.* Calyx inflated after flowering, inclosing the 2-celled berry. Corolla rotate-campanulate, yellowish.
6. *CAPSCICUM.* Corolla rotate. Capsule 2—3-celled, dry and leathery.
7. *SOLANUM.* Corolla rotate. Berries 2-celled.
8. *LYCOPHANSICUM.* Corolla rotate. Berries 3—6-celled.
9. *ATROPA.* Corolla campanulate. Berry 2-celled.

1. *PETÛNIA.*

Calyx with a short tube and a 5-cleft leafy limb. Corolla salverform; tube cylindric; limb in 5 unequal, flat, folded lobes. Stamens 5, unequal, included, inserted into the middle of the corolla tube. Capsule 2-valved.

1. *P. violæææ.**Purple Petunia.*

Stem weak, hairy, viscid; leaves broad-ovate, acute, on short, winged petioles, entire; peduncles axillary, solitary, as long as the leaves, and scarcely longer than the swelling tube of the corolla; sepals obtuse; corolla-limb bright purple, divided into 5 unequal, rounded, acute lobes, of which the uppermost is smallest. A pretty plant, quite common in cultivation. Stems trailing or climbing, 2—4 ft. long. *An. or bien. July till frost.*

2. *P. álba.**White Petunia.*

Stem weak, hairy, viscid; leaves ovate, acute, upper ones sessile; flowers axillary, solitary, greenish-white, fragrant; corolla-tube scarcely expanded at top, 2—3 times as long as the obtuse sepals, the limb flat and spreading. Distinguished from the last by the stouter habit, more slender corolla-tube, and its white flowers, the color of which seems to be constant. It is frequently considered a variety of the last.

2. *NICOTIÂNÀ.*

Calyx urn-shaped, 5-cleft. Corolla funnel-form, or salver-form, regular; limb plaited, 5-lobed. Stigma capitate. Capsule 2-celled, 2—4-valved. Seeds minute. *An.*

1. *N. Tabacum*.*Tobacco*.

Viscid-pubescent; stem erect, paniculate above; leaves very long, lanceolate, sessile, decurrent; flowers dull rose-color, rather handsome; corolla-tube inflated at the throat; lobes acute. A coarse, rank plant, with large, clammy, pubescent leaves, which are often 2 ft. long. Stem 4–6 ft. high. The common tobacco is cultivated in Southern N. Eng., and in all the Middle, Eastern and Southern States, but most abundantly in the latter. *July*.

3. *DATŪRA*.

Calyx tubular, ventricose, 5-angled, 5-toothed, separating transversely in fruit from the persistent, orbicular base. Corolla funnel-form, with a long-cylindrical tube; limb plaited, 5-parted. Stigma 2 lipped. Capsule globular, prickly, 2-celled, 2-valved. Seeds large. *An*.

1. *D. Stramōnium*.*Thorn Apple*.

Smooth; stem erect, dichotomous, fleshy, hollow, sometimes spotted with purple; leaves large, ovate, irregularly dentate, almost lobed, of a dark, lurid green, on long, fleshy petioles; flowers large, 2'–3' long, dull white, often tinged with dull purple, on peduncles arising from the forks of the branches; calyx-teeth acuminate; fruit of the size and shape of a hen's egg, covered with short, sharp, tumid spines. A rank and extremely poisonous weed, common in waste grounds. The odor of the flowers and of the leaves when bruised is extremely offensive. Stem 1–3 ft. high.

4. *NICÁNDRA*.

Calyx 5-cleft, 5-angled; angles compressed. Segments sagittate, enlarged in fruit, and covering the 3–5-celled, globose berry. Corolla campanulate; border open, plaited, nearly entire. Stamens 5, converging. *An*.

1. *N. physaloides*.*Apple of Peru*.

Smooth, herbaceous; stem erect, branching; leaves large, broad-ovate, sinuately toothed, angular; flowers axillary, terminal, solitary, pale-blue, white in the centre, with 5 blue spots; calyx closed, with the angles very acute. A coarse weed-like herb, common in gardens, sometimes springing up spontaneously in waste grounds. Stem 2–5 ft. high. *Aug. An*.

5. *PHÝSALIS*.

Calyx 5-cleft, persistent, reticulated, inflated after flowering, and inclosing the globular, 2-celled berry. Corolla spreading, campanulate, with a very short tube; limb obscurely 5-lobed. Stamens 5, converging. *An*.

1. *P. viscōsa*.*Yellow Henbane*.

Viscid-pubescent; stem at first erect, afterward decumbent, branching, herbaceous; leaves solitary or in pairs, ovate, or lance-ovate, cordate or tapering at base, repandly toothed, or entire; flowers nodding, solitary, growing just above the axils; corolla greenish-yellow, twice as long as the calyx-segments, with 5 brownish spots at the base inside; fruit yellow or orange-color, inclosed in the inflated, angular calyx. A very variable plant, about a foot high, common on dry hills and road-sides. *July–Aug*.

6. *CÁPSICUM*.

Calyx erect, 5-parted, persistent. Corolla rotate; tube very short; limb plaited, 5-lobed. Stamens converging. Capsule dry, inflated, 2–3-celled. Seeds flat, extremely acrid. *An*.

1. *C ánnuum*.*Red Pepper*.

Smooth; stem herbaceous, angular, branching above; leaves ovate-acuminate, petiolate, entire; flowers axillary, solitary, nodding; peduncles smooth; calyx angular, with 5 short, acute lobes; corolla white, lobes spreading, larger than the calyx; fruit oblong, or subglobose, varying from dull red to yellow, and of all possible shapes and sizes. A well known garden annual, cultivated for its stimulating fruit. Stem 1–2 ft. high. *All summer*.

7. *SOLÁNUM*.

Calyx mostly 5-parted, spreading, persistent. Corolla usually rotate; tube very short; limb mostly 5-cleft, plaited in the bud, its thin edges rolled in. Stamens exsert, converging around the style. Filaments very short. Anthers opening at top by 2 pores. Berry usually 2-celled.

1. *S. Dulcamàra*.*Bitter-sweet*.

Stem shrubby towards the base, climbing, more or less smooth; leaves ovate-cordate, upper ones hastate, frequently auricled at base; flowers in corym-

bosc clusters, mostly opposite the leaves; corolla dull purple, the segments reflexed, with 2 green spots at base; berries oval, scarlet, poisonous. A shrubby climbing plant, common in moist thickets, especially distinguished by its showy clusters of scarlet berries. Stem 4–6 ft. long. *July. Per*.

2. *S. nigrum*.*Nightshade*.

Smooth, herbaceous; stem very branching, with rough angles; leaves ovate, toothed and undulate; flowers small, white, in drooping, lateral umbels; anthers yellow; berry globular, black. A low, mean-looking weed, usually considered poisonous. Common in waste grounds. *July–Aug. An*.

3. *S. tuberòsum*.*Potato*.

Rhizoma producing tubers; stem ascending, herbaceous, nearly simple, with winged-angles; leaves interruptedly pinnate; alternate leaflets much the smallest, all entire; flowers dull-white, sometimes purplish, nodding, in terminal umbels, pedicellate. One of the most useful of cultivated plants. The tubers furnish a large proportion of the food of man in those districts where it is cultivated. It sports into numberless varieties, differing in color, shape and quality. *June–July. Per*.

4. *S. pseudo-Cápsicum*.*Jerusalem Cherry*.

Evergreen; stem shrubby, branching above; leaves oblong-lanceolate, dark green, smooth and shining; flowers solitary, opposite the leaves, nodding; corolla white; anthers orange; berries globose, scarlet, as large as small cherries. An evergreen shrub, sometimes cultivated. Stem 2–4 ft. high.

5. *S. Melongēna*.*Egg-plant*.

Stem prickly, herbaceous, branching; leaves ovate, downy, prickly; flowers small, whitish; fruit large, ovate, varying from 2'–8' in length, smooth, glossy, purple. A coarse, prickly plant, 2–3 ft. high, cultivated for its edible fruit. A variety with smaller, white fruit is sometimes cultivated. *July–Sep. An*.

8. *LYCOPÉRSICUM*.

Calyx mostly 5-parted, persistent. Corolla rotate; tube very short; limb mostly 5-lobed, plicate. Anthers converging, opening at top by 2 pores. Berry 3–6-celled, often torose. *An*.

1. *L. esculéntum*.*Tomato*.

Fatty; stem herbaceous; leaves unequally pinnatifid; segments incised, glaucous beneath; peduncles bearing clusters of greenish-yellow flowers; fruit torulose, furrowed, smooth, green at first, but bright red and juicy when mature. A common garden annual, cultivated for its abundant, juicy fruit. It is a large coarse-looking plant, with a disagreeable odor, generally reclining on other plants for support. Stem 3–5 ft. long. There are varieties having the fruit yellow, and globose, or pear-shaped. *All summer*.

9. *ÁTROPA*.

Calyx persistent, 5-cleft. Corolla campanulate. Stamens distant. Berry globose, sitting on the calyx, 2-celled. *An*.

1. *A. Belladónna*.*Deadly Nightshade*.

Smooth, herbaceous; stem branching below; leaves large, ovate, entire; flowers dull, lurid purple; berries large, green at first, black when mature, full of purple juice; stem 4 ft. high. A very poisonous plant, suspicious in appearance, but without the offensive odor which marks so many of the poisonous plants of this order. Gardens. *July–Aug*.

10. *LÝCIUM*.

Calyx 2–5-cleft, short. Corolla tubular, limb mostly 5-lobed, spreading. Stamens 4–5. Filaments bearded, closing the throat of the corolla. Berry 2-celled. Seeds several, reniform.

1. *L. Bárbarum*.*Barbary Vine*.

Shrubby; stem branching; branches long, pendulous, ending in a spiny point, often furnished with axillary spines; leaves lanceolate, often in clusters, smooth, acute or obtuse, tapering to a petiole; flowers axillary, solitary or in pairs, greenish-purple; calyx mostly 3-cleft; berries orange-red. A shrubby vine, frequent in cultivation. Its long, hanging branches form thick masses on trellises and walls. *July*.

ORDER LXXXVII. Gentianaceæ.

SYNOPSIS OF THE GENERA.

1. *GENTIANA*. Corolla tubular at base, 4–5 cleft, open or closed at apex, the lobes either with folds between, or fringed at apex. Leaves green.

2. *BARTONIA*. Corolla somewhat campanulate, consisting of 4 nearly distinct segments. Yellowish herbs destitute of green foliage.

8. LIMNANTHEMUM. Corolla somewhat campanulate with 5 segments. Flowers umbelled. Aquatics, with simple leaves.

4. MENYANTHES. Corolla funnel-form, hairy within. Flowers racemed. Leaves trifoliata.

1. GENTIANA.

Calyx 4—5 cleft. Corolla marcescent, regular, tubular at base; limb 4—5-cleft, usually with plaited folds between the erect or converging segments. Stamens 4—5, inserted on the corolla-tube. Style short, or none. Stigmas 2, persistent. Capsule 1-celled, 2-valved, many-seeded.

1. G. crinita.

Fringed Gentian.

Stem round, erect, branching; branches spreading at base, and then perfectly straight and erect; leaves lanceolate, or ovate-lanceolate, sessile, cordate, or rounded at base; flowers of a rich blue, solitary, showy, terminating the branches; calyx 4-angled, 4-parted, segments acuminate, as long as the corolla-tube; corolla campanulate at base, open at summit, expanding when the sun shines; segments obovate, beautifully fringed on the margin. A very delicate and interesting plant, with superb flowers, 1'—2' long, not uncommon in low, grassy meadows. Stem 10'—15', often turning purple. *Oct.*

2. G. Andr  wsii.

Soap-wort Gentian.

Smooth; stem erect, simple; leaves lanceolate or oval-lanceolate, acute or narrowed at base, 3-veined, rough on the margin; flowers large, purplish-blue, in sessile, terminal heads, sometimes solitary in the upper axils; corolla inflated, club-shaped, closed at top, about 10-cleft, inner teeth folded and fringed, equalling the exterior. A common species, distinct from the last in its whole appearance. Stem 1—2 ft. high. The flowers resemble large buds, and often deceive those unacquainted with the plant. *Sept.—Oct. Per.*

2. BART  NIA.

Calyx 4-parted. Corolla subcampanulate, deeply 4-cleft; segments but slightly united, erect. Stamens short. Stigma large, persistent, at length 2-lobed. Capsule oblong, 1-celled, 2-valved, clothed with the persistent calyx and corolla.

1. B. tenella.

Screw-stem.

Stem slender, erect, square, branching above, apparently leafless; leaves minute, scale-like, subulate, mostly opposite; flowers small, yellowish-white, 1—3 on the opposite, sometimes alternate branches; pedicels bracted at base; style none. A slender, branching plant, of a yellowish-white color, appearing leafless. Damp grounds. Stem 3'—8' high. *Aug. An.*

3. LIMNANTHEMUM.

Calyx 5-parted. Corolla between campanulate and rotate; tube short; limb 5-lobed; lobes deciduous, fringed merely at the base or margin, furnished with glandular appendages, alternating with the 5 stamens. Style short, or none. Stigma 2-lobed, persistent. Capsule 1-celled, valveless.

1. L. lacun  sum.

Lake-flower.

Floating; stem filiform, bearing at top a single leaf, an umbel of flowers, and a tuft of short radicles, which sometimes take the place of stolons, shooting out leaves, which form a distinct plant; leaves reniform, floating at top, somewhat peltate, rough above, spongy and paler beneath; flowers 5—6, in an umbel beneath the water, opening one at a time just above the surface; corolla white; lobes oval, smooth, except the yellowish gland at base, twice as long as the lanceolate divisions of the calyx. A curious aquatic, with stems varying with the depth of the water, 1—3 ft. long. Each stem is furnished with a single leaf, 1'—2' long, on a petiole varying with the depth. *July. Per.*

4. MENYANTHES.

Calyx 5-parted. Corolla funnel-form, 5-parted, deciduous, covered within with a white beard. Stamens 5. Styles slender, persistent. Stigma 2-lobed, capitate, 1-celled.

1. M. trifoliata.

Buck Bean.

Scape round, erect; leaves radical, trifoliolate, on long petioles, with sheathing, membranous bases; leaflets oval, varying to obovate, entire, sessile; flowers in long, terminal, naked racemes; pedicels thick, bracted at base; corolla white or flesh-colored, clothed within with long, soft hairs; segments acute, 3 times as long as the obtuse sepals. A handsome plant about a foot high, common in N. Eng. and N. York, especially in the Northern parts, in bogs and swamps, where its large, black roots penetrate deep into the soft earth. *May. Per.*

ORDER LXXXVIII. Apocynace  .—*Dogbane-family.*

1. AP  CYNUM.

Calyx very small, 5-parted. Corolla campanulate, with 5 short lobes. Stamens 5, inserted at the base of the corolla, alternating with 5 glandular appendages on its throat. Anthers sagittate, converging, much longer than the very short filaments. Stigma ovoid, obscurely 2-lobed, slightly adherent to the anthers. Fruit composed of 2 long, slender, distinct follicles.

1. A. andros  mifolium.

Dog's-bane.

Smooth; stem erect, branching above, reddened by the sun on one side, with diverging, forked branches; leaves ovate, entire, dark-green above, paler, and sometimes hoary beneath, rounded at base, tapering at apex, distinctly petiolete; flowers in loose, terminal and axillary cymes; pedicels as long as the flowers; corolla white, striped with rose-color, with 5 acute, revolute segments; tube much longer than the ovate, acuminate calyx-teeth; follicles 2'—3' long, nodding. A very handsome plant, 2—3 ft. high. Common in thickets and the borders of woods. *June—July. Per.*

2. A. cannabinum.

Indian Hemp.

Stem erect, dividing above into long, slender, upright, or ascending branches; leaves oblong, or oblong-lanceolate; smooth in one variety; varying to ovate, more or less downy on the under side, or both sides in another variety; sometimes cordate at base, on very short petioles, generally smooth; flowers very small, greenish-white, in dense, erect, many-flowered cymes, shorter than the leaves, and terminating the branches; corolla-lobes nearly erect, the tube scarcely longer than the lanceolate calyx-teeth. A very variable species, 2—8 ft. high, in thickets and along river banks, distinguished by its very small flowers and ascending branches. *June—July.*

2. VINCA.

Corolla salver-form, contorted; limb 5-cleft; lobes oblique; throat 5-angled. Ovary with 2 glands at base. Capsule follicular, erect, tapering to the extremity.

1. V. minor.

Small Periwinkle.

Evergreen; stems procumbent, shrubby, terete, smooth, leafy; leaves smooth and shining, elliptic-lanceolate; flowers solitary, axillary, alternate, pedunculate, violet; sepals lanceolate. An evergreen shrub, not uncommon in cultivation. *May.*

3. N  RUM.

Calyx with 5 teeth at base on the outside. Corolla salver-form; segments contorted; throat with a crown, consisting of 5 incised leaflets. Filaments inserted into the middle of the corolla-tube. Anthers sagittate, adhering to the stigma by the middle.

1. N. Ole  nder.

Oleander.

Evergreen, shrubby; leaves linear-lanceolate, smooth, entire, coriaceous, on short petioles, 3 together, prominently veined beneath; flowers large, in terminal clusters, rose-color; crown of the corolla flat; segments 3-toothed. A splendid shrub, 4—6 ft. high, common in house cultivation. There are varieties with white, variegated and double flowers.

ORDER LXXXIX. Asclepiadace  .—*Milkweed-family.*

1. ASCL  PIAS.

Calyx 5-parted; lobes small, spreading. Corolla deeply 5-cleft; segments valvate in prefloration, reflexed when open, deciduous. Crown consisting of 5 hooded lobes, resting on the united mass of the stamens, and furnished with an incurved, horn-like process proceeding from the base of each. Filaments united into a tube, inclosing the style. Anthers adhering to the stigma, with 2 cells opening longitudinally, each containing pollen-masses. These masses are arranged in 5 pairs; the masses of 2 adjacent anther-cells forming 1 pair, which hang by an attenuated apex from 5 glands on the 5 angles of the stigma. Follicles 2, often 1 by abortion, ovate or oblanceolate, more or less

inflated. Seeds flat, furnished with a long tuft of silky hairs. *Per.*

* *Leaves opposite.*

1. *A. Cornuti.* *Common Milkweed.*

Stem erect, simple, rarely branching; leaves nearly oval, tapering at both extremities, petiolate, smooth above, pubescent beneath; flowers in large, dense, simple, globose umbels, axillary and terminal, odorous; calyx-segments lanceolate; petals reflexed, dull purple; crown nearly of the same color, obtuse, bidentate; horn short and stout; pods mostly acuminate, covered with soft, spine-like processes. A very common and coarse weed, 3–5 ft. high, in rich soils and road-sides. Every part of the plant in this, and the whole genus, is full of a white, sticky milk, which, however, is the most abundant in this species. *July.*

2. *A. phytolacoides.* *Poke-leaved Milkweed.*

Mostly smooth; stem erect, tall, simple; leaves broad-ovate; upper ones often oval-lanceolate; all tapering at both ends, short-petiolate, entire, paler and smooth, or slightly downy beneath; umbels on terminal and lateral peduncles, nearly equalling the leaves; pedicels numerous, long, slender, loose, nodding, nearly as long as the peduncle; segments of the reflexed corolla greenish-white; hoods of the crown white or flesh-colored, truncate, 2-toothed at summit. A handsome species, with large leaves and flowers, common in moist thickets. Stem 3–5 ft. high. *June.*

3. *A. obtusifolia.* *Blunt-leaved Milkweed.*

Smooth and somewhat glaucous; stem erect, simple, terminating in 1, rarely 2, long-peduncled umbels; leaves oval or oblong-ovate, obtuse, mucronate, sessile, somewhat clasping and cordate at base, very undulate on the margin; umbel large, many-flowered, smooth; pedicels long and slender; flowers large; corolla greenish-purple; hoods of the crown large, shorter and paler than the slender horn. A common species, in sandy woods and soils, distinguished by its waved leaves and long-peduncled, terminal, globose umbels. Stem 2–3 ft. high. *July.*

4. *A. incarnata.* *Swamp Milkweed.*

Nearly smooth; stem erect, branching above, marked with 2 pubescent lines, as also the branches and peduncles; leaves oblong-lanceolate, acute or acuminate, obtuse at base, with distinct petioles; umbels numerous, many-flowered, erect, often opposite; peduncles half as long as the leaves; segments of the corolla reddish-purple; hoods of the crown flesh-color, entire, about as long as the subulate, incurved horns. A common species, 2–3 ft. high, in wet grounds. It occurs with broader leaves, more or less pubescent, which is the var. *pulchra.* *July–Aug.*

** *Leaves mostly not opposite.*

5. *A. quadrifolia.* *Four-leaved Milkweed.*

Smooth; stem erect, slender, simple; leaves ovate, sometimes ovate-lanceolate, acuminate, petiolate, smooth and thin, mostly in whorls of 4; others opposite; umbels few, loose, on long, axillary or terminal peduncles; pedicels filiform, marked with a pubescent line; segments of the corolla white, tinged with pink; hoods of the crown white, 2-toothed; horn stout and thick. A very delicate and elegant species, 1–2 ft. high, not uncommon in dry woods. *July.*

6. *A. verticillata.* *Whorled Milkweed.*

Nearly smooth; stem erect or decumbent at base, branching above, marked with lines of minute hairs, leafy; leaves narrow-linear, revolute on the margin, paler beneath, in numerous whorls of 5 or 6; umbels few, small, arising from the upper whorls, on peduncles as long as the leaves; segments of the corolla ovate, greenish-white; hoods of the crown white, hardly half as long as the arching horns; pods very smooth. An elegant species, 1–2 ft. high, marked by its abundant, narrow leaves in numerous whorls. Common on dry hills in some districts, especially Southern N. Eng. *July–Sep.*

7. *A. tuberosa.* *Butterfly-weed.*

Stems erect, ascending, clustered, hairy, leafy, with divaricate branches at top; leaves scattered, oblong-lanceolate ranging to almost linear, entire, sessile, or the lower ones shortly-petiolate, hairy, obtuse at base; umbels numerous, on short peduncles, forming a large, terminal, showy corymb; flowers numerous, bright orange; segments of the corolla greenish-yellow; hoods of the crown narrow-oblong, bright orange; horns slender, nearly erect; pods clothed with minute down. A very splendid species, not uncommon in dry, sandy soils. The thick, fleshy root sends up a cluster of erect stems, which are often stained with purple, 2 ft. high. *July–Sept.*

ORDER XCI. Oleaceæ.—*Olive-tribe.*

SYNOPSIS OF THE GENERA.

* *Flowers always perfect and complete.*

1. *SYRINGA.* Calyx minute, with 4 erect teeth. Corolla salver-form, with a long tube.

2. *LIGÚSTRUM.* Calyx tubular, with 4 minute teeth. Corolla funnel-form, with a short tube.

3. *CHIONÁNTHUS.* Corolla consisting of 4 very long, linear, scarcely united petals.

** *Flowers polygamous or diœious.*

4. *FRÁXINUS.* Petals mostly none. Trees with pinnate leaves. Fruit a samara.

1. *SYRINGA.*

Calyx small, with 4 erect lobes. Corolla salver-form; tube much longer than the calyx-limb, 4-cleft, with obtuse, spreading segments. Stamens short, included in the tube. Capsule 2-celled, 2-valved. *Shrubs.*

1. *S. vulgaris.*

Lilac.

Leaves cordate, entire, smooth, green on both sides; flowers light purple, large, fragrant, in dense thyrses; corolla-limb somewhat concave. A very ornamental shrub, universally cultivated. Stem 5–8 ft. high, very bushy. There are varieties with bluish-purple and white flowers. *April–May.*

2. *S. Pérsica.*

Persian Lilac.

Leaves smooth, lanceolate or pinnatifid, green on both sides; flowers of a lighter purple, and in smaller, looser thyrses than those of the last, fragrant; limb of the corolla flat. A smaller and more delicate shrub than the last, frequent in cultivation, but not so common as *S. vulgaris*. Stem 3–6 ft. high. *April–May.*

2. *LIGÚSTRUM.*

Calyx tubular, short, deciduous, with 4 minute teeth. Corolla funnel-form, 4-lobed; tube short; lobes spreading, ovate, obtuse. Stamens inserted on the corolla-tube, included. Stigma 2-cleft. Berry 2-celled, 2–4-seeded.

1. *L. vulgare.*

Prim.

Shrubby; leaves oblong-lanceolate, varying to obovate, acute, or obtuse entire, smooth, dark green, on short petioles; flowers small, white, in dense, terminal, thyrsoid panicles; anthers large, exsert; berries black, bitter. A smooth shrub, 4–6 ft. high, with dark green leaves, which are mostly persistent till late in the winter. It is frequently used for hedges in the vicinity of cities, where it has become naturalized in thickets and road sides. *May–June.*

3. *CHIONÁNTHUS.*

Calyx very small, persistent, 4-parted. Corolla in 4 very long and linear divisions, scarcely united at base. Stamens very short, inserted at the base of the corolla. Style very short. Drupe fleshy, 1-celled, 1-seeded. *Trees.*

1. *C. Virginica.*

Fringe-tree.

Leaves oval-oblong or obovate-lanceolate, smooth or somewhat downy, petiolate, entire; flowers snow-white, on long pedicels, in terminal and axillary racemes, forming rather dense, drooping panicles; calyx smooth; segments of the corolla linear, acute, $\frac{1}{4}$ – $\frac{1}{2}$ long; drupes purple, covered with a bloom. A large shrub, or small tree, very ornamental in cultivation. Its snow-white flowers are arranged in gracefully drooping panicles. *May–June.*

4. *FRÁXINUS.*

Flowers polygamous or diœious, often perfect. Staminate flowers—calyx small, 4-cleft, or wanting; petals 4, commonly wanting in the N. American species; stamens usually 2. Pistillate flowers—calyx and corolla as in the staminate; style single; stigma 2-cleft. Fruit a 1–2-celled samara, flattened, winged at apex, mostly 1-seeded by abortion. *Leaves pinnate. Trees.*

1. *F. Americana.*

White Ash.

Leaflets 7–9, petiolate, oblong or oblong-ovate, acuminate, entire or obscurely toothed, glaucous beneath, mostly smooth, except on the veins; calyx present; corolla wanting; fertile flowers in loose panicles; the barren in dense, contracted ones; samara obtuse, narrow, spatulate, with a long, tapering base. A large and noble forest-tree of symmetrical growth. The trunk is covered with gray, more or less furrowed bark, while the branchlets are smooth, with a greenish-gray bark. Common every where in rich woods. *April–May.*

2. *F. pubescens.**Red Ash.*

Leaflets 7—9, petiolate, lanceolate or lance-ovate, acuminate, soft-downy beneath, as well as the petioles and young shoots; calyx present; corolla wanting; inflorescence as in the last; samara rather more broadly spatulate than in the last, obtuse, usually abruptly tapering at base. A common tree in Southern N. Eng. and New York, distinguished from the last by its downy branchlets and the deep brown color of the older bark. *April—May.*

3. *F. sambucifolia.**Black Ash.*

Leaflets 7—11, sessile, ovate-lanceolate or oval-lanceolate, acuminate, serrate, more or less hairy on the veins beneath, obliquely obtuse at base; calyx and corolla both wanting; samara oblong, extremely obtuse at both ends. A tall, slender tree, with darker-colored bark than the first, and very tough and elastic wood. The buds are of a deep blue color. This Ash is most common in the extreme Northern parts of the U. S., where it is abundant in moist woods and swamps. *May.*

SECTION III.—APÉTALÆ.

ORDER XCII. Aristolochiaceæ.—*Birthwort-family.*1. *ASARUM.*

Calyx campanulate; limb 3-cleft; tube adherent to the ovary. Stamens 12, inserted on the ovary. Anthers short, fixed to the middle of the filaments. Style very short. Stigma 6-rayed. Fruit globular, fleshy, 6-celled, crowned with the calyx. *Per.*

1. *A. Canadense.**Wild Ginger.*

Pubescent, stemless; leaves 2, broad-reniform, large, on long, hairy petioles, soft-downy; flowers solitary, large, nodding, on a downy pedicel proceeding from between the 2 petioles, pressed close to the ground, sometimes just beneath the surface; calyx woolly; segments reflexed from the middle, brownish-purple within. A curious plant, common in some districts, in rich woods. The rootstock is very aromatic. *July.*

ORDER XCIII. Phytolaccaceæ.—*Poke-tribe.*1. *PHYTOLACCA.*

Calyx of 5 petaloid sepals. Stamens 5—30. Styles 5—12. Ovary composed of 5—12 united carpels, forming a 5—12-celled, half-globular berry. Cells 1-seeded.

1. *P. decandra.**Poke-weed.*

Smooth; stem tall, terete, branching, changing at length to deep purple; leaves large, ovate, acute at both ends, petiolate, entire; flowers greenish-white, in long, cylindrical racemes, at first terminal, but at length opposite the leaves; stamens 10; styles 10; fruit globose, depressed, dark purple, juicy. A tall, stout, poisonous plant, 6—8 ft. high, rising from a very large, branching, poisonous root. *July—Sep.*

ORDER XCIV. Chenopodiaceæ.—*Goosefoot-tribe.*

SYNOPSIS OF THE GENERA.

* *Flowers all perfect.*

1. *SALICORNIA.* Stamens 1—2. Flowers in 3s. Leafless succulent plants.
2. *SALSOLA.* Calyx at length with a horizontal wing on the back, forming a border. Prickly, succulent plants, with subulate leaves.
3. *SUAEDA.* Calyx never winged on the back, succulent, inclosing the fruit when mature. Fleshy plants, with linear leaves.
4. *CHENOPodium.* Calyx 5-parted, neither winged nor succulent in fruit. Seeds lenticular, depressed. Leafy. Weeds.
5. *BETA.* Calyx 5-parted, fleshy, and inclosing the reniform seed when mature. Root large and fleshy.

* *Flowers dioecious or polygamous.*

6. *SPINACIA.* Flowers dioecious. Calyx of the fertile flowers 2—4-cleft. Styles capillary.
7. *ACNIDA.* Flowers dioecious. Calyx of the fertile flowers 3-parted. Stigmas 3—5, sessile, linear, revolute.
8. *TRIPLIX.* Flowers monoecious and polygamous. Pistillate flowers destitute of a calyx. Styles 2, partly united.

1. *SALICORNIA.*

Flowers perfect, 3 together. Calyx small, turbinate, closed;

margin toothed or incised. Stamens 1—2. Style 1. Utricle inclosed in the calyx, 1-seeded. *Leafless.*

1. *S. herbacea.**Samphire.*

Stem erect or ascending, branching; branches opposite, jointed, fleshy, green, terminating in spikes; joints thickened upward; flowers small, sessile at the joints of the stem, bearing branches, and forming a sort of spike. A leafless, fleshy, branching plant, growing 6'—12' high in salt marshes, along the coast and near salt springs. *Aug. An.*

2. *SALSOLA.*

Flowers perfect, with 2 bracts at base. Calyx 5-parted, persistent; segments horizontally winged on the back, inclosing the depressed fruit at base, and crowning it with a broad, circular, scarious border. Stamens mostly 5. Styles 2. Seeds horizontal. Embryo spiral.

1. *S. Kali.**Saltwort.*

Stem decumbent, diffusely branching, herbaceous; leaves alternate, subulate, sessile, channelled, terminating in a sharp prickle; flowers single, green, succulent, sessile, bracted at base; calyx-lobes converging, and forming a sort of beak to the inclosed utricle. A very prickly, bushy, spreading plant, common on sandy shores. Stem 1—2 ft. high. *Aug. An.*

3. *SUAEDA.*

Flowers perfect. Calyx urceolate, 5-parted; segments at length succulent and inclosing the depressed fruit. Stamens 5. Style 1. Stigmas 2—5. Embryo spiral. *An.*

1. *S. maritima.**Sea Goosefoot.*

Smooth; stem mostly erect, branching; leaves sessile, linear or subulate, fleshy, semi-cylindrical, somewhat acute; flowers 2—3 together, in sessile, axillary clusters, greenish; bractlets minute; calyx inflated in fruit; utricle thin and almost transparent, containing a black, shining seed. A weed of the salt marshes. Stem 1—2 ft. high. *Aug.*

4. *CHENOPodium.*

Flowers perfect, bractless. Calyx 5-parted, at length dry, partially enveloping the fruit. Stamens 5. Styles 2. Utricle membranaceous. Seed lenticular. *An.*

1. *C. album.**Pigweed.*

Smooth; stem erect, branching; leaves rhomboid-ovate, coarsely toothed, entire at base, pale green, petiolate, white and mealy beneath; uppermost entire; flowers greenish, mealy, sessile, in irregular spikes, forming large, terminal panicles. A very common and homely weed, 2—5 ft. high, in waste grounds. *July—Sep. An.*

2. *C. hybridum.**Tall Pigweed.*

Smooth; stem erect, slender, very branching; leaves ovate, cordate at base, acuminate, angular, with a few large, remote teeth, light green on both sides; flowers greenish, sessile, in divaricate racemes, which are loosely arranged in a terminal, leafless panicle. The flowers have a very unpleasant odor. A common weed in waste grounds. Stem 2—3 ft. high. *July—Aug.*

3. *C. Bòtrys.**Oak of Jerusalem.*

Viscid-pubescent; stem exceedingly branching; leaves oblong, obtuse, sinuate; upper ones spatulate-lanceolate; flowers green, numerous, fragrant, in short, leafless racemes, arranged in large, terminal and lateral panicles, of which the terminal is much the tallest. A fragrant species sometimes cultivated, growing in dry fields and along road-sides. Stem 1—3 ft. high. *July—Aug.*

5. *BETA.*

Flowers perfect. Calyx of 5 sepals. Stamens 5. Styles 2, very short, erect. Stigmas acute. Seeds reniform, inclosed in the fleshy calyx. *Bien.*

1. *B. vulgaris.**Common Beet.*

Stem erect, branching, furrowed; leaves alternate, nearly entire; lower ones ovate, upper narrower; flowers green, in dense, axillary, sessile clusters, arranged in spikes, forming terminal panicles; root fleshy. The common beet is cultivated every where for culinary purposes. The roots are of various shades of red, yellow and white. *Aug.*

6. *SPINACIA.*

Flowers dioecious. Barren flowers—calyx 5-cleft; stamens 5. Fertile flowers—calyx 2—4-cleft. Styles 4, capillary. Utricle contained in the hardened and sometimes spiny calyx. *An.*

1. *S. oleracea*.*Spinage*.

Stem erect, branching; leaves hastate-lanceolate, tapering at base, on long petioles; flowers greenish; barren in a terminal panicle; fertile in dense, sessile, axillary racemes; fruit sessile, prickly, or unarmed. A common plant in kitchen gardens. Stem 1–2 ft. high. *June–July*.

7. ACNIDA.

Flowers dioecious. Barren flowers—calyx 5-parted; stamens 5. Fertile flowers—calyx 3-parted; stigmas 3–5, sessile, linear, revolute; ovary 3–5-angled. Utricle 1-seeded. *An.*

1. *A. cannabina*.*Water Hemp*.

Stem erect, branching, furrowed, smooth; leaves lanceolate, tapering to a long point, attenuate at base, petiolate; flowers small, greenish, sessile in clusters, forming crowded, axillary and terminal spikes, or panicles; fruit smooth, with acute angles. A common, homely plant, in salt marshes; rare in inland swamps. Stem 2–3 ft. high. *Aug.–Sep.*

8. ÁTRIPLEX.

Flowers polygamous, the barren and fertile mostly on the same plant. Staminate and perfect flowers bractless; calyx 3–5-parted; stamens 3–5; style, when present, 2-parted. Pistillate flowers furnished with 2 bracts, but destitute of a calyx; styles 2, partly united. Utricle depressed, inclosed in the bracts. *Leaves alternate. An.*

1. *A. hortensis*.*Garden Orache*.

Stem erect, branching, herbaceous; leaves triangular, dentate, of the same color on both sides, quite variable in shape; flowers green, in dense clusters, forming an interrupted, terminal spike; calyx of the fruit ovate, reticulate, entire. Occasionally found in cultivated ground, and sometimes grown as a pot-herb. Stem 2–3 ft. high. *July*.

2. *A. pátula*.*Spreading Orache*.

Stem procumbent, very branching; leaves triangular-hastate, or sinuately toothed, acuminate, of a thickish texture; upper ones lanceolate; bracts of the fertile flowers rhombic, acute, studded with tuberculous points on their upper surface; flowers greenish, in dense clusters, arranged in long, axillary and terminal, interrupted spikes. A common weed in salt marshes. Stem 1–2 ft. long. *Aug. An.*

ORDER XCV. *Amaranthaceæ*.—*Amaranth-family*.

1. AMARANTHUS.

Flowers monœcious or polygamous, sometimes dioecious, with 3 bracts. Sepals 3–5, mostly colored, persistent. Stamens 3–5. Styles 2–3, sometimes 4, filiform. Utricle indehiscent, circumscissile, 1-seeded. *An.*

* *Stamens 8.*1. *A. albus*.*White Cock'scomb*.

Smooth; stem erect or ascending, mostly branching, angular; branches spreading or horizontal; leaves obovate, or oval-spatulate, entire, retuse, with a mucronate point, light green, tapering at base, petiolate; ramial leaves much smaller; flowers greenish, inconspicuous, in axillary clusters, furnished with numerous lance-subulate bracts, tipped with bristles. A very common weed in cultivated grounds. Stem 1–2 ft. high. *July*.

** *Stamens 5.*2. *A. hybridus*.*Hybrid Amaranth*.

Pubescent and somewhat rough; stem erect, furrowed, simple or sparingly branched; leaves alternate, ovate, or ovate-lanceolate, mucronate, emarginate, on long petioles; flowers minute, green, at length dull red, in dense, crowded, axillary and terminal spikes. The terminal spike is decompound; but the others are mostly simple; bracts subulate, longer than the flowers. A common weed in waste and cultivated grounds. Stem 1–5 ft. high. *July–Oct*.

3. *A. hypochondriacus*.*Princess' Feather*.

Nearly or quite smooth; stem erect, stout, simple or sparingly branched; leaves ovate, varying to oblong, entire, mucronate, green, spotted or tinged with purple; flowers minute, sessile, clustered in erect, compound spikes, deep purplish-red; bracts subulate, of the same color. Common around gardens,

and often cultivated. The whole plant is more or less tinged with purple. Stems 2–3 ft. high, with long, plumose clusters. *July–Sep. An.*

4. *A. melancholicus*.*Love-lies-bleeding*.

Stem erect, simple or sparingly branched; leaves ovate-lanceolate, colored; flowers minute, in dense clusters, arranged in axillary, roundish, nodding, pedunculate racemes. The whole plant is of a purple color. Stem 1–2 ft. high. *July–Aug.*

2. GOMPHRENA.

Flowers perfect. Bracts 5, colored; 3 outer carinate, converging. Sepals 5, hairy. Disk cylindric, 5-toothed. Stamens 5. Stigma 1. Utricle circumscissile, 1-celled. *An.*

1. *G. globosa*.*Globe Amaranth*.

Stems erect, hairy, with opposite, axillary branches; leaves opposite, obtuse, pubescent; flowers purple, in dense, globose, solitary heads, furnished with 2 leaves at base. A pretty annual, cultivated for its almost imperishable and fadeless heads of flowers. Stem 10'–18' high. *July–Sep.*

3. CELÓSIA.

Sepals 3–5, colored. Stamens 5, united at base by a plicate disk. Style 2–3-cleft. Utricle circumscissile. *An.*

1. *C. cristata*.*Cock's-comb*.

Stem erect, mostly simple; leaves ovate, acuminate, mostly alternate; stipules filicate, striate; flowers small, densely crowded, in large, compressed, thin clusters, bright, purplish-red. The crests of flowers vary 2'–8' in breadth. Common in cultivation. The whole plant is bright-red; but the large crests are the most ornamental portions. Stem 1–2 ft. high. *June–Sep.*

ORDER XCVI. *Nyctaginaceæ*.—*Mirabilis-family*.

1. MIRABILIS.

Calyx funnel-form with 2 bracts at base; tube contracted, free from the ovary; limb plaited, entire, deciduous. Stamens 5. Style 1. Stigma globose. *An.*

1. *M. Jalapa*.*Four o'clock*.

Stem erect, dichotomous, smooth; leaves opposite, one of each pair smaller, cordate, acuminate, smooth; flowers pedicellate, in axillary and terminal clusters, large and fragrant; root large and tuberous. A common and very showy plant, in cultivation. Stem 2–3 ft. high. Flowers usually purple, but varying to white, yellow, red and variegated, opening about 4 p. m., and closing by sunrise. *June–Sep.*

ORDER XCVII. *Polygonaceæ*.—*Buckwheat-tribe*.

1. RHËUM.

Calyx colored, of 6 sepals, persistent. Stamens 9. Styles 3. Stigma many-parted, reflexed. Achenia 3-angled; angles winged. *Per.*

1. *R. Rhaponticum*.*Garden Rhubarb*.

Stem erect, stout, fleshy, hollow; joints sheathed by large stipules; leaves ovate, cordate, obtuse, smooth; petioles rounded beneath, channelled above; flowers very numerous, greenish-white, in fasciculate clusters, arranged in racemes, which form a large, terminal panicle, at first inclosed in a large, white, membranous bract, which at length bursts and releases it. A very common plant in gardens, cultivated for its large, acid petioles, which are used for pies, tarts and sauces. Stem 3–6 ft. high. *May*.

2. POLYGNONUM.

Calyx 4–6, mostly 5-parted; segments often petaloid, persistent, and inclosing the achenium. Stamens 4–9, mostly 8. Styles 2–3, mostly 3, short, filiform. Achenium mostly triangular.

* *Flowers axillary. Stems jointed. Stigmas 8.*1. *P. aviculare*.*Knot-grass*.

Smooth; stem procumbent, spreading, branching; branches ascending; leaves oblong, or oblong-lanceolate, rough on the margin, acute, sessile, mostly pale-green; stipules short, white, gashed; flowers nearly sessile, 2–3 together

In the axils of the leaves, greenish-white, sometimes reddish-white. A common little weed, in waste grounds and along road-sides. Stems 4'—10' long. *June—Nov. An.*

2. P. ténue.

Slender Knot-grass.

Stem erect, slender, sparingly branched, acutely angled; leaves narrow-linear, sessile, erect, very acute; stipules tubular, fringed; flowers very small, greenish-white, often solitary, nearly sessile; stamens 5—8. A slender species, 4'—12' high, not uncommon in dry, sandy soils. *July—Sep. An.*

*** Flowers pedicellate, apiculate, arising from truncate bracts.

3. P. articulatum.

Joint-weed.

Stem erect, slender, branching; leaves linear-subulate, deciduous; flowers in long, slender, panicle racemes, rose-color, solitary, nodding, on filiform peduncles, proceeding from the imbricate, truncate bracts; stamens 8; styles 3; fruit acutely triangular, smooth and shining. A singular little plant apparently leafless, and covered with a profusion of small, rose-colored, nodding flowers. Stem 4'—12' high. Common in sandy soils near the sea-coast. *Aug. An.*

*** Flowers in terminal or axillary spikes. Leaves lanceolate, varying to obovate.

4. P. Hydropiper.

Water-Pepper.

Smooth; stem erect or ascending, simple or branching; leaves lanceolate, entire, acuminate, punctate with pellucid dots, waved and rough on the margin; flowers inflated, fringed; flowers pale greenish-white, in loose, interrupted, elongated, nodding spikes; stamens 6—8; styles 2—3, united at base; fruit lenticular or triangular. A common plant, whose intense acidity is universally known. It grows in low grounds and damp situations generally. Stem 1—2 ft. high. *Aug.—Sep.*

5. P. hydropiperoides. *Mild Water-Pepper.*

Stem mostly smooth, erect or ascending, often decumbent and rooting at base; leaves lanceolate, somewhat hairy, or ciliate; stipules hairy, long-fringed; flowers reddish, in slender, loose and weak spikes; stamens 7—8; styles 3, united below; fruit triangular. A species somewhat resembling the last, but destitute of its acid properties. Stem 1—2 ft. high. Swamps and low grounds. *July—Aug. Per.*

6. P. Pennsylvanicum. *Pennsylvanian Knot-grass.*

Stem erect, branching, smooth below; branches and peduncles more or less covered with glandular hairs; leaves lanceolate, long-acuminate, petiolate, roughish on the margin and mid-vein; stipules smooth, not ciliate; flowers rose-colored, pedicellate, in oblong, nearly erect, crowded spikes; stamens 6—8; style 2-parted; fruit lenticular. A common species in low, moist situations. Stem 1—4 ft. high. *July—Oct. An.*

7. P. Persicaria.

Spotted Knot-weed.

Stem erect, branching, smooth; leaves lanceolate, acuminate, petiolate, entire, usually marked with a large, heart-shaped, brown spot near the centre; stipules fringed; flowers rose-color, in short, dense, oblong, terminal spikes; peduncles generally smooth; stamens mostly 6; styles 2, united nearly half way. A common species in wet grounds and waste places, especially distinguished from the last by its spotted leaves and fringed stipules. Stem 1—3 ft. high. *June—Aug. An.*

8. P. orientale.

Prince's Feather.

Stem tall, erect, branching, somewhat hairy; leaves ovate, acuminate, petiolate; upper stipules hairy, somewhat salver-form; flowers large, open, rose-colored, in long, nodding, showy spikes; calyx 5 parted; stamens 7; style 2-cleft; fruit lenticular. A tall and very showy plant, 4—8 ft. high, frequently found in waste grounds, and very often cultivated. *Aug. An.*

9. P. amphibium.

Amphibious Knot-weed.

Stem ascending, prostrate, or decumbent at base, rooting at the lower joints; leaves oblong-lanceolate, or oblong, varying from acute to nearly obtuse, tapering at base, or somewhat cordate; flowers rose-color, in oblong or ovoid, dense, terminal spikes; stamens 5; styles 2; fruit flattened, smooth. A very variable species, growing in and about ponds and stagnant water. There are two principal varieties. *Var. aquaticum* has long, jointed, rooting stems, creeping in the mud, or floating in the water; leaves large, nearly obtuse, long-petioled. *Var. terrestre* grows around the borders of ponds, and has a more or less hairy stem, erect or ascending, with acute leaves; upper ones on very short petioles. *July—Aug. Per.*

10. P. Virginianum. *Virginian Knot-weed.*

Stem erect, simple, smooth below, slightly hairy above; leaves large, ovate, or ovate-lanceolate, acuminate, rounded at base, on short petioles, ciliate; stipules truncate, hairy, fringed; flowers small, greenish-white, remote, bracted, in a long, slender, terminal spike, which sometimes has 1—2 short branches. A common species in shady thickets, distinguished by its large, broad leaves, and its very long and slender spike. Stem 2—3 ft. high. *July—Aug. Per.*

*** Flowers in somewhat capitate clusters or loose racemes. Leaves cordate or sagittate.

11. P. sagittatum. *Arrow-leaved Bindweed.*

Stem weak, ascending or prostrate, square, with the angles bristly backward; leaves sagittate, entire, acute, with the mid-vein prickly beneath; stipules smooth; flowers small, whitish, generally tinged with rose-color, in small, terminal heads, on long, slender, smooth peduncles; stamens mostly 8; styles 3; fruit acutely 3-angled. A common rough species in wet grounds, supporting itself on other plants by its prickly stem, which is 1—2 ft. long. *June—Aug. An.*

12. P. arifolium. *Halbert-leaved Bindweed.*

Stem weak, ascending, 4-angled; angles prickly backward; leaves hastate, entire, acuminate, on long petioles; flowers rose-colored, in few-flowered, loose, slender racemes, terminating the branches; peduncles rough, with stiff, glandular hairs; calyx sometimes 4-parted; stamens 6; styles 2; fruit lenticular. A prickly species, like the last, supporting itself by its prickles. Low grounds. Not uncommon. Stem 1—2 ft. high. *Aug. An.*

13. P. Convolvulus.

Black Bindweed.

Stem angular, twining or prostrate, somewhat rough, naked at the joints; leaves petiolate, hastate, cordate at base, acute, entire; stipules nearly entire; flowers greenish-white, sometimes tinged with purple, pedicellate, in clusters of 3—4, nodding in fruit, forming small, interrupted racemes; outer calyx-lobes carinate; stamens 8; styles 3; fruit mostly smooth, triangular. A homely weed in cultivated grounds. Stem 1—5 ft. long. *June—Sept. An.*

14. P. ciliolode.

Fringed Bindweed.

Slightly pubescent; stems climbing and twining; leaves somewhat hastate, cordate at base, acuminate; stipules fringed at base with reflexed hairs; flowers greenish-white, in panicle racemes; calyx-lobes scarcely carinate; fruit smooth and shining, triangular. A climbing species, distinguished by the fringed joints. Stems 3—10 ft. long. Thickets and rocky hills. *July—Sept. An.*

15. P. Fagopyrum.

Buckwheat.

Smooth; stem erect, branching; leaves sagittate or hastate, cordate at base, generally approaching to triangular in outline; stipules semi-cylindrical; flowers white, often greenish or tinged with rose-color, in corymbose racemes, or panicles; stamens 8; styles 3; fruit longer than the calyx. A very common grain, which remains in fields as a weed, where it has been cultivated. The flowers are furnished with 8 yellow nectaries alternating with the stamens, which are very attractive to the bees. Stem 2 ft. high. *An.*

3. RUMEX.

Calyx persistent. Sepals 6; 3 outer united at base, spreading in fruit; 3 inner often bearing granules. Stamens 6. Styles 3. Stigmas many-cleft, forming a tuft. Achenium 3-angled, covered by the converging, valve-like, inner sepals.

* Flowers mostly perfect; some or all of the inner sepals bearing granules.
† Leaves lanceolate, acute at both ends.

1. R. verticillatus.

Swamp Dock.

Stem erect, sparingly branched above; leaves oblong-lanceolate, flat, entire, acute, pale green, long and narrow; flowers in crowded whorls, forming long, nearly leafless racemes; pedicels dilated above, reflexed in fruit, several times longer than the calyx valves, strongly reticulate, somewhat obtuse, all bearing large granules. An aquatic species, most common in the northern districts of N. Eng. and N. York, distinguished by its long, narrow leaves, and almost leafless racemes. Stem 2—3 ft. high. Muddy grounds. *June. Per.*

2. R. Hydrolapathum.

Great Water-Dock.

Stem tall, stout, branching; leaves oblong-lanceolate, acute, wavy on the margin, on flat petioles; flowers greenish, on capillary pedicels, nodding, in whorls, forming upright racemes, the whole combined in a large, compound, terminal, and nearly leafless panicle; calyx-valves ovate, obtuse, all bearing granules. A stout aquatic species, 5—6 ft. high, in wet places, and, like the

last, more common in the Northern districts. The lower leaves are often a foot long, and 3'—4' broad. *July*.

†† *Leaves more or less cordate at base.*

3. *R. obtusifolius.* *Broad-leaved Dock.*

Stem erect, stout, somewhat rough, branching; lower leaves ovate, obtuse, cordate at base, waved ones crenate on the margin, slightly hairy on the veins beneath; upper ones oblong-lanceolate, acute; flowers in loose, distant whorls, forming long, nearly naked racemes; valves sharply toothed at base, usually only one of them bearing a granule. A common and troublesome weed in waste and cultivated grounds. The root leaves are very large, often with red veins and stalks. Stem 2—4 ft. high. *July*.

4. *R. crispus.* *Yellow Dock.*

Smooth; stem erect, branching; leaves lanceolate, acute, strongly waved on the margin; lower ones rounded or cordate at base; flowers in numerous whorls, arranged in crowded racemes, interrupted below, leafless above, forming a large, terminal panicle; valves broad-cordate, nearly entire at base, all usually bearing granules. Root yellow, spindle-shaped. A troublesome weed in cultivated grounds. Stem 2—3 ft. high. *June—July. Per.*

** *Flowers dioecious. Inner sepals without granules.*

5. *R. acetosella.* *Sheep Sorrel.*

Stem erect, leafy, branching; leaves lanceolate-hastate; upper ones lanceolate; all entire, petiolate, very acid to the taste; flowers small, greenish at first, but soon tinged with a dull red, in slender, leafless racemes, forming a terminal panicle; anthers of the barren flowers yellow; valves ovate. A common weed, 8'—8" high, in dry, sandy soils. Its acid leaves are well known. *May—Oct. Per.*

ORDER XCVIII. Lauraceæ.—*Laurel-tribe.*

1. SÁSSAFRAS.

Flowers dioecious. Calyx spreading, colored, 6-parted. Barren flowers with 9 stamens, in 3 rows; inner row with a pair of pedicellate glands at base of each stamen. Anthers opening by 4 valves. Fertile flowers with 6 short, rudimentary stamens. Style filiform. Ovary ovoid, 1-seeded. *Trees.*

1. *S. officinale.* *Sassafras.*

Leaves ovate, entire, or 3-lobed, and tapering at base, alternate, petiolate, mucilaginous, as also the young shoots, covered when young, as also the buds, with a soft, silky down; flowers greenish-yellow, in pedunculate clusters, appearing before the leaves; drupes dark blue, on a red stalk. A common, small tree, 20—40 ft. high, distinguished by the spicy flavor of its inner bark, especially that of the root. *Woodlands. April—May.*

2. BENZÛIN.

Flowers dioeciously polygamous. Calyx 6-parted, open. Sterile flowers with 9 stamens in 3 rows; the 3 inner ones with a pair of opposite, pedicellate glands at base. Anthers 2-celled, 2-valved. Fertile flowers with 15—18 rudimentary stamens. Ovary globular. Drupe obovoid, 1-seeded.

1. *B. odoriferum.* *Spice-bush.*

Leaves oblong-obovate, entire, sessile, wedge-shaped at base, thin, paler beneath, nearly smooth; flowers greenish-yellow, in compound, nearly sessile clusters, appearing before the leaves; pedicels scarcely as long as the flowers; calyx-teeth oblong; berries red. A shrub, 5—12 ft. high, in moist woods. The bark of the young branches has a pleasant aromatic flavor, resembling that of gum Benzoin. *April.*

ORDER XCIX. Thymelæacæ.—*Mezereum-family.*

1. DÍRCA.

Calyx petaloid, tubular, truncate; margin waved, or obscurely 4-lobed. Stamens 8, long and slender, inserted in the calyx-tube, much exsert; alternate ones longer. Style filiform. Stigma capitate. Drupe oval, 1-seeded.

1. *D. palustris.*

Leather-wood.

Shrubby; stem very branching; leaves oblong-obovate or obovate, entire, alternate, on short petioles, paler beneath; flowers appearing before the leaves, pale yellow, rather small, funnel-form, 2—3 together, projecting from an involucre consisting of large, brownish, hairy scales; berry oval, small, reddish. A low shrub of irregular, straggling growth. 3—6 ft. high; most common in Northern N. Eng. and N. York, distinguished by the yellow flowers appearing long before the leaves, and its extremely tough, grayish bark. *April—May.*

2. DÁPHNE.

Calyx 4-cleft, withering; limb spreading. Stamens 8, included in the calyx-tube. Style 1. Drupe 1-seeded. *Shrubs.*

1. *D. Mezereum.*

Mezereum.

Leaves deciduous, lanceolate, entire, sessile, in terminal tufts; flowers sessile, in clusters of 3—4, proceeding from the lateral buds; calyx salver-form, with ovate, spreading segments; stamens inserted in 2 rows near the top of the tube, with short filaments; stigma sessile. A very beautiful exotic shrub, whose pink flowers appear in great profusion as early as March. The bark, and other parts, are extremely acrid. Stem 1—3 ft. high.

2. *D. Lauræla.*

Spurge Laurel.

Leaves evergreen, lanceolate, smooth, acute, entire, nearly sessile; flowers in clusters of about 5, proceeding from the lateral buds, greenish-yellow, fragrant. A handsome species, 4—5 ft. high, with fragrant flowers, and elegant, evergreen foliage. *March—April.*

ORDER CI. Santalacæ.—*Sandal-wood-family.*

1. COMÁNDRA.

Flowers perfect. Calyx somewhat urecolate; limb 4—5-parted, with an adherent, 5-lobed disk. Stamens 4—5, opposite the calyx-lobes, inserted on the disk alternately with its lobes. Fruit dry, 1-seeded, crowned with the persistent calyx-lobes.

1. *C. umbellata.*

False Toad-flax.

Very smooth; stem erect, slender, branching above; leaves oblong or oblong-obovate, entire, alternate; flowers small, greenish-white, in small clustered umbels of 3—5, forming a kind of terminal corymb, each cluster with 4 deciduous bracts; anthers connected with the opposite calyx-lobes by several yellow threads. A low, smooth herb, 6'—12' high; common in dry and rocky grounds. *June. Per.*

2. NYSSA.

Flowers dioecious-polygamous. Barren flowers—calyx 5-parted; stamens 5—10, inserted on a glandular disk. Perfect, or fertile flowers—calyx 5-parted; tube adherent to the ovary; stamens 5, perfect or rudimentary; fruit an oval, berry-like drupe. Nut 1-seeded. *Trees.*

1. *N. multiflora.*

Gum-tree.

Leaves oval or obovate, acute at both ends, entire, hairy on the petiole and mid-vein, of a thick and firm consistence, and a deep and shining green; flowers greenish, small, in 3—6-flowered clusters, on long, branching peduncles; fertile peduncles mostly 3-flowered; drupes oval, deep blue. A common tree of middling size, growing in swamps and low grounds, distinguished by the thick, shining leaves and horizontal branches. The wood is tough and white, and almost impossible to split. *June.*

ORDER CIII. Ulmaceæ.—*Elm-tribe.*

1. ÚLMUS.

Flowers perfect, rarely polygamous. Calyx campanulate, 4—9-cleft. Stamens 4—9. Filaments filiform. Styles 2. Ovaries flat, compressed. Fruit a flat samara with a winged margin, by abortion 1-celled, 1-seeded. *Trees.*

1. *U. Americana.*

Elm.

Young branches nearly smooth; leaves oblong-obovate, acuminate, doubly serrate, smooth above, pubescent beneath, oblique, rounded or cordate at base

marked with regular and prominent veins, on short petioles; flowers small, purplish, pedicellate, in lateral clusters, appearing before the leaves; fruit oval, fringed with dense down. A well-known tree, of large size and very beautiful growth, distinguished by its long, pendulous branches. Very common both in woods and open fields. *April*.

2. *U. fulva*.*Slippery Elm.*

Young branches rough-pubescent; leaves oblong-ovate, acute, scarcely oblique at base, unequally and doubly serrate, pubescent and very rough on both sides; buds covered with a rust-colored down; flowers nearly sessile, in dense clusters at the ends of the branchlets; calyx hairy; stamens much exsert, reddish, usually 7; fruit nearly orbicular, naked on the margin. A smaller species, not as common as the last, but frequent in rich, rocky woods. The mucilaginous quality of the inner bark, giving it its common name, is well known. *An.*

3. *U. racemosa*.*Cork Elm.*

Leaves ovate, varying to oblong-obovate, acuminate, obliquely cordate at base, doubly serrate, smooth above, somewhat pubescent beneath; flowers pedicellate, in clusters of 2–5, arranged in compound racemes; fruit elliptical, pubescent, fringed on the margin with down. A large species, distinguished from the others by the numerous corky excrescences, and the corky ridges of the branches and downy branchlets. Not uncommon in Western N. Eng. and in N. York. *April*.

2. CÉLTIS.

Flowers monœcious-polygamous. Calyx 5–6-parted, persistent. Stamens 5–6. Stigmas 2, long, recurved. Drupe globular, 1-seeded. *Trees or Shrubs.*

1. *C. occidentalis*.*Hackberry.*

Leaves ovate, entire, oblique at base, with a long, fine-acuminate point, rough above, rough-pubescent beneath, often cordate or half-cordate at base; flowers small, greenish-white, axillary, solitary or in pairs, pedunculate, appearing at the same time as the leaves; lower ones usually with only stamens; fruit globular, with a thin, sweet flesh, small, dull red. In growth resembling an Elm, and ranging in size from a small tree to one of considerable height. Not uncommon in Northern or Eastern N. Eng., and becoming more abundant Westward and Southward. *May*.

ORDER CIV. Saururaceæ.—*Lizard-tail-family.*

1. SAURURUS.

Flowers perfect. Stamens 6–8, or more, with long filaments. Fruit compressed, of 3–4 pistils united at base, with recurved stigmas. Ovaries mostly 1-seeded.

1. *S. cernuus*.*Lizard's-tail.*

Stem erect, weak, angled; leaves cordate, acuminate, petiolate; flowers very numerous, sessile, white, in long, slender, plume-like, naked, pedunculate spikes, nodding near the top, consisting simply of the long stamens, the ovaries, and the white, tubular scales. An elegant plant in marshes, distinguished by its long, nodding plume of white flowers. Most common in Western N. York. *July–Aug. Per.*

ORDER CVI. Callitrichaceæ.—*Starwort-family.*

1. CALLITRICHÆ.

Flowers polygamous. Stamens solitary, in the sterile flowers between the bracts, in the fertile between the pistil and sterile filaments, filiform. Anther cordate. Styles 2. Achenium indehiscent, 4-lobed, 4-celled.

1. *C. verna*.*Water Chickweed.*

Floating; stems capillary, growing in tufts; leaves 3-nerved; upper ones oblong-spatulate, or oblong-ovate, arranged in a stellate cluster at top; lower ones linear; flowers minute, axillary; bracts whitish; anthers exsert, yellow. A very delicate little water-plant, growing in shallow ponds and in muddy

grounds. The leaves vary to nearly linear. The stem, instead of floating, sometimes creeps along on the mud, bearing crowded, oblong leaves. *April–Aug. An.*

ORDER CVIII. Euphorbiaceæ.—*Spurge-family.*

SYNOPSIS OF THE GENERA.

* Apparent flowers containing both stamens and pistils.

1. EUPHORBIA. Barren flowers numerous, each consisting of a single stamen, surrounding the pedicellate, perfect flower, and inclosed in a common involucre.

** Stamens and pistils in separate flowers on the same plant.

2. ACALYPHA. Calyx of the barren flowers 3–4-parted. Capsule smooth. Low weeds.

3. RICINUS. Barren flowers with a 5-parted calyx. Petals none. Tall annuals.

4. BÚCUS. Barren flowers with a 3-leaved calyx; petals 2; stamens 4. Fertile flowers with a 4-leaved calyx; petals 3. *Evergreen shrubs.*

1. EUPHORBIA.

Flowers monœcious, in a subcampanulate, usually petaloid, 4–5-parted involucre. Sterile flowers numerous, included within the involucre, consisting of a single stamen on a jointed pedicel, and furnished with a bract at base. Anthers composed of 2 separate, globular cells. Fertile flower solitary, in the centre, pedicellate, finally much exsert, consisting of a 3-lobed, 3-celled ovary, destitute of a calyx. Styles 3, each 2-parted. Capsule consisting of 3 1-seeded carpels, opening each by 2 valves. *Herbs with a milky juice.*

* Heads of flowers umbellate. Leaves opposite.

1. *E. Lathyris*.*Caper Spurge.*

Smooth; stem erect, stout, branching; leaves linear-lanceolate, somewhat acute, entire, sessile; umbel usually with 4 dichotomous rays; leaves of the involucre oblong-ovate, cordate at base, acuminate; fruit and seeds smooth. A tall species, common in gardens, and sometimes springing up in waste grounds. Stem 2–3 ft. high. *July–Sep. Bien.*

** Heads of flowers in axillary and terminal clusters.

2. *E. hypericifolia*.*Spurge.*

Stem smooth, nearly erect, with spreading branches; leaves opposite, oval-oblong, or oblong-ovate, serrate, ciliate, obliquely cordate at base, 3–5-nerved beneath, often with oblong purple spots; heads whitish, in axillary and terminal clusters, forming a sort of terminal corymb. A slender weed-like plant, 8'–15' high, common in waste and cultivated grounds. *July–Aug. An.*

3. *E. maculata*.*Spotted Spurge.*

Mostly hairy; stem prostrate, diffusely branching; leaves oval, sessile, serrulate, smoothish above, pale and hairy beneath, often with large, purple spots above, short-petiolate; heads of flowers in axillary clusters, minute, whitish. A prostrate species, forming flat patches. The stem and leaves abound in the milky juice of the genus. Common in cultivated grounds. *June–Sep. An.*

4. *E. polygonifolia*.*Sea Spurge.*

Very smooth; stem prostrate, very branching; leaves narrow-oblong, obtuse at base, entire, destitute of veins; heads of flowers solitary in the axils of the branches. A very smooth, glaucous, prostrate species, with abundant milky juice. The dichotomous stem is usually bright red. Common along sandy sea-shores. *July–Sept. An.*

2. ACALYPHA.

Flowers monœcious. Barren flowers very small, crowded in spikes; calyx 4-parted; stamens 3–16, united at base. Fertile flowers few, at the base of the barren spikes; calyx 3-parted. Styles 3, elongated, fringed.

1. *A. Virginica*.*Three-seeded Mercury.*

More or less pubescent; stem erect or ascending, branching; leaves ovate or oblong-ovate, long-petiolate, serrate; barren flowers in short axillary spikes, on short peduncles; pistillate flowers 1–3 together in the axils, pedicellate, each enveloped in a large, leaf-like, broad, cordate-ovate, unequally lobed and toothed, acuminate bract, which is longer than the barren spike. A common weed in cultivated grounds. Stem 6'–15' high. *Aug. An.*

8. *RÍCINUS*.

Flowers monœcious. Barren flowers—calyx 5-parted; stamens numerous. Fertile flowers—calyx 3-parted; styles 3, each 2-parted. Capsule prickly, 3-celled, 3-seeded. *An.*

1. *R. communis*.*Castor-oil Plant.*

Herbaceous; stem erect, branching, glaucous or white, and mealy in appearance; leaves peltate, palmate, with the lobes lanceolate, serrate, on long petioles; fruit prickly. A tall, stout annual, of a very peculiar, light sea-green color. Cultivated for the oil expressed from its seeds. Stem 6–8 ft. high, with very large leaves. *July–Aug.*

4. *BUXUS*.

Flowers monœcious. Barren flowers—calyx 3-leaved; petals 2; stamens 4, with a rudimental ovary. Fertile flowers—calyx 4-leaved; petals 3. Styles 3. Capsule 3-beaked, 3-celled, 2-seeded. *Shrubs.*

1. *B. sempervirens*.*Box.*

Evergreen; leaves opposite, ovate or obovate, entire, dark green, the petioles hairy on the margin; anthers ovate-sagittate. The leaves are sometimes narrowly lanceolate. A dwarf variety used for edgings is much the most common.

ORDER CX. Juglandaceæ.—Walnut-tribe.

1. *JUGLANS*.

Barren flowers in long and simple aments; calyx unequally 3–6-cleft; stamens 8–40, with very short filaments. Fertile flowers solitary, or several together; calyx 4-parted; corolla 4-petaled; stigmas 2. Fruit drupaceous, with a spongy, indehiscent epicarp, and a rugose, irregularly-furrowed endocarp. *Trees.*

1. *J. cinerea*.*Butternut.*

Leaves 15–19-foliate; leaflets oblong-lanceolate, serrate, obtuse at base, acuminate, pubescent, especially beneath; petioles and young branchlets clothed with clammy hairs; fruit oblong, about 2' in length, clothed with a clammy pubescence, tapering to an obtuse point; nut rough, with sharp, ragged ridges. A handsome forest tree, whose edible kernel is well known. It is a moderately tall tree, with grayish bark, and wide-spreading branches. *April–May.*

2. *J. nigra*.*Black Walnut.*

Leaflets numerous, 15–21, ovate-lanceolate, long-acuminate, serrate, somewhat cordate or oblique at base, smooth above, somewhat pubescent beneath, as also the petioles; fruit globose, covered with rough dots; nuts marked with rough ridges. A large and noble tree, with brownish bark, and deep, violet-brown heart-wood, well known as a favorite material for furniture. Common westward, but not in N. Eng. or Eastern N. York. *May.*

2. *CARYA*.

Barren flowers in slender aments, mostly 3 on one peduncle; calyx 3-parted; stamens 3–8, nearly destitute of filaments. Fertile flowers 2–3 together; calyx 4-parted; corolla none; stigma 4-lobed. Fruit globular, inclosed in a 4-valved epicarp, which is at length leathery and opening, falls away when fully ripe. Nut smooth, 4–6-angled. *Trees.*

1. *C. álba*.*Shagbark.*

Leaflets about 5, lanceolate-obovate or oblong-lanceolate, acuminate, serrate, slightly pubescent beneath; fruit globular, depressed at apex; nut somewhat compressed, covered with a thick epicarp, tapering abruptly at the end, thin-shelled, with a large, oily, delicious kernel. A noble tree, common in woods, and distinguished by the roughness of its old trunks caused by the bark scaling off in long plates or strips, which adhere by the middle. The wood makes very valuable timber and the best of fuel. *May.*

2. *C. tomentosa*.*Thick-shelled Walnut.*

Leaflets 7–9, oblong-lanceolate or obovate-lanceolate, acuminate, somewhat serrate, pubescent beneath and on the petioles; aments hairy; fruit between ovoid and globose; epicarp thick and almost woody; nut marked with about 6 angles, with a well-flavored kernel which is, however, small, and difficult to obtain, on account of the great hardness and thickness of the shell. A tall tree, distinguished from the last by the more numerous and pubescent leaflets, and the 6-angled and mostly brownish nut. *May.*

3. *C. glàbra*.*Pig-nut.*

Leaflets 5–7, lanceolate or ovate-lanceolate, serrate, mostly smooth, acuminate; fruit obovate or pyriform, with a thin, dry epicarp, opening not more than half way; nut small, extremely hard, with a thickish shell, and a small, insipid, and sometimes bitterish kernel. A tall tree, with ridged, but scarcely scaly bark, and very tough wood. Common in woods. *May.*

4. *C. amàra*.*Hickory.*

Leaflets 7–11, oblong-lanceolate, serrate, acuminate, smooth; fruit globular, with a very thin and soft epicarp or husk, opening half way down; nut obovate, with a very thin shell, capable of being crushed by the fingers; kernel very bitter. A tall and graceful tree, with the bark of the trunk broken into ridges, but not scaly; smooth and unbroken above. The young branches are covered with a very smooth, yellowish bark. Common in rich woods. *May.*

ORDER CXI. Cupuliferæ.—Oak-tribe.

SYNOPSIS OF THE GENERA:

* Nuts inclosed in a prickly involucre.

2. *CASTÁNEA*. Barren flowers in cylindrical aments. Fertile flowers 3, in a single involucre. Nuts somewhat ovoid, with convex or flattened sides.

3. *FÁGUS*. Barren flowers in a globose ament, on a long peduncle. Fertile flowers 2 in a single involucre. Nuts 3-angled.

** Nuts not inclosed in a prickly involucre.

1. *QUÉRCUS*. Nut ovoid-cylindrical, partly enveloped in a nearly hemispherical, scaly cup.

4. *CORYLUS*. Nut ovoid, entirely inclosed in a thick, lacerated involucre. Fertile flowers in capitate clusters.

5. *OSTRYA*. Fertile flowers in pairs, in loose aments, contained in a thin, inflated sac, which incloses the ripened nut.

6. *CARPINUS*. Fertile flowers in a loose ament, in alternate pairs, sessile at the base of the leafy, persistent bracts, which, enlarged, bear the naked fruit at base.

1. *QUÉRCUS*.

Barren flowers in loose, slender, nodding aments; calyx 6–8-parted; stamens 5–12. Fertile flowers solitary or clustered; involucre or capsule cup-shaped, scaly; ovary 3-celled, with 6 ovules; stigma 3-lobed. Nut 1-celled, 1-seeded.

* Acorns ripening the first year. Lobes of the leaves not mucronate.

1. *Q. álba*.*White Oak.*

Leaves oblong or oblong-ovate, smooth, paler, and glaucous beneath, and also pubescent when young, light green above, deeply and smoothly 5–7-lobed; lobes oblong or oblong-linear, obtuse, nearly entire; fruit pedunculate; cup hemispherical, much shorter than the ovate acorn; kernel sweetish, edible. A large, tall, noble forest tree, common every where. The strength and durability of the timber gives it great value.

2. *Q. bicolor*.*Swamp White Oak.*

Leaves oblong-ovate, tapering and entire at base, white-downy underneath, coarsely and minutely 8–12-toothed, on short petioles; teeth unequal, acutish; fruit mostly in pairs, on long peduncles; cup hemispherical, scarcely half as long as the oblong-ovate acorn; kernel sweet. A tall, handsome tree, common in swamps and low grounds, distinguished by its leaves, which are dark green above and white-downy beneath. *May.*

3. *Q. montàna*.*Mountain Oak.*

Leaves broad-ovate, dentate, with broad, obtuse teeth nearly equal in length, white-downy underneath, with short and yellowish petioles; fruit on short peduncles; cup hemispherical; acorn ovate. A middle sized tree, not uncommon in rocky woods, distinguished by its leaves, which in color, texture, and the evenness of their teeth, have some resemblance to those of the Chestnut. *May.*

4. *Q. prinoides*.*Dwarf Chestnut Oak.*

Shrubby; leaves obovate or oblong-lanceolate, dentate, with coarse and nearly equal teeth, downy beneath, on short petioles; fruit sessile, or on very short peduncles; cup hemispherical; acorn ovate; kernel sweet. A dwarf species, distinguished by its small size. Not uncommon in dry, sandy soils. Stem 2–5 ft. high. *May.*

** Fruit ripening the second year, mostly sessile. Lobes of the leaves mucronate.

5. *Q. rubra*.*Red Oak.*

Leaves smooth, oblong, paler beneath, sinuately 7–11-lobed; lobes spreading, entire or dentate, acute, with narrow sinuses between; cup very flat and

shallow, saucer-shaped, much shorter than the oblong-ovate acorn. A tall, handsome tree, very common in forests every where. The wood is reddish and coarse-grained, chiefly valuable for fuel. The leaves turn red in autumn. *May*.

6. *Q. coccinea*.

Scarlet Oak.

Leaves oblong or oval to outline, smooth, deeply and sinuately 5-9-lobed, bright-green on both sides, on long petioles; lobes divaricate, sparingly toothed, with broad, open, deep sinuses, which extend two-thirds to the mid-vein, or further; cups very scaly, somewhat turbinate, inclosing about $\frac{1}{2}$ of the round-ovate, acorn. A very large and handsome tree, of symmetrical growth, distinguished from the last especially by the smaller, bright-green leaves, which are much more deeply lobed, and turn crimson in autumn. *May*.

7. *Q. tinctoria*.

Black Oak.

Leaves obovate or oblong-ovate, pubescent with rusty down beneath, at length nearly smooth, sinuately lobed; lobes somewhat dentate, with shallow, sometimes deep sinuses between; cup deep, very scaly, inclosing about $\frac{1}{2}$ of the nearly globular acorn. A large tree, common in forests, distinguished by the nearly black color of the bark, and by its yellow inner bark, which furnishes the Quercitron of dyers. The leaves turn to a brownish-yellow in autumn. *May*.

8. *Q. ilicifolia*.

Scrub Oak.

Shrubby; leaves obovate, cuneate at base, with 3-5 angular lobes, white-downy beneath, on long petioles; cup turbinate, flatish; acorn small, ovoid. A shrub 4-8 ft. high, of irregular, straggling growth, common in dry, sandy soils. The barren flowers are of a reddish color. *May*.

2. CASTĀNEA.

Barren flowers in separate clusters, arranged in long, cylindrical aments; calyx 5-6-parted; perfect stamens 8-15. Fertile flowers 2-3 together, inclosed in a prickly, 4-lobed involucre; calyx-border 5-6-lobed; ovary 3-6-celled, with 10-15 ovules; styles 3-6 capillary; nuts 2-3 together, inclosed in the enlarged, thick, coriaceous involucre. *Chiefly trees.*

1. *C. vésca*.

Chestnut.

Leaves oblong-lanceolate, acuminate, marked with very prominent, straight veins, and coarse, mucronate teeth, smooth and green on both sides; sterile aments long, pendulous, axillary at the extremities of the branches, with the fertile flowers at base, yellowish-white, very abundant, appearing after the leaves are full-grown; nuts 2-3 together, of a peculiar, rich brown, hairy above, flattened on the sides, inclosed in a green, very prickly, 4-parted involucre. A very common forest tree, of large size and handsome growth. The wood is light and elastic, but coarse-grained. *July*.

3. FAGUS.

Barren flowers in small, globose heads, on nodding peduncles; calyx campanulate, 5-6-cleft; stamens 5-12. Fertile flowers mostly 2 together, inclosed within a prickly involucre, bracted at base; calyx with 4-5 subulate lobes; ovary 3-celled; cells 2-ovuled; styles 3, filiform. Nuts 1-seeded, acutely triangular, 2 together in the prickly, 4-lobed involucre. *Trees.*

1. *F. ferruginea*.

Beech.

Leaves oblong-ovate, acuminate, with distinct teeth, thin, marked by the straight, prominent veins, softly pubescent and ciliate when young, at length nearly or quite smooth, light green, withering and mostly persistent in the winter; flowers appearing with the leaves; barren yellowish, soft-pubescent, in little, globular clusters, on slender peduncles, 2' long; nuts usually 2 together, dark brown, with an oily, sweet kernel. A handsome and very common forest tree, distinguished by its smooth, undivided, light gray bark, and the young shoots more or less pubescent with soft hairs. *May*.

4. CORYLUS.

Barren flowers in long, drooping, cylindrical aments, each furnished with a concave bract and a 2-parted calyx, forming a 3-lobed scale, to which the 8 stamens are affixed; anthers 1-celled. Fertile flowers several together, in terminal and lateral heads; calyx none; ovaries several, 2-celled; cells 1-ovuled; stigmas 2, filiform. Nut bony, ovoid, surrounded by the enlarged, leafy, coriaceous involucre, consisting of 2-3 enlarged bracts, united and tubular at base, more or less lobed or fringed at summit. *Shrubs.*

1. *C. Americana*.

Hazelnut.

Young branches glandular-pubescent; leaves cordate, rounded, acuminate,

coarsely serrate; aments appearing before the leaves; stigmas of the fertile buds red, forming a little tuft at the top of the bud; involucre somewhat campanulate below, dilated, coarsely toothed and compressed above, glandular-pubescent, twice as long as the globular nut. A very common shrub, 3-8 ft. high, growing in thickets, well-known for its fine-flavored kernel. *April*.

2. *C. rostrata*.

Beaked Hazelnut.

Young branches smooth; leaves ovate or oblong-ovate, somewhat cordate at base, acuminate, coarsely and unequally serrate; flowers as in the last; involucre-tube campanulate, contracted above the globular nut, and prolonged into a strong, curved, tubular beak, which is 2-parted, fringed and covered with stiff bristles. A shrub resembling the last, but most obviously distinguished by the involucre of the fruit, and the young branches, which are smooth. Stem 2-3 ft. high. Not uncommon along streams and moist thickets. *May*.

5. ŌSTRYA.

Barren flowers in drooping, cylindrical aments; stamens 8-12, furnished, with a roundish, ciliate bract, instead of a calyx; anthers bearded at apex. Fertile flowers numerous, with small, deciduous bracts in loose aments, each inclosed in an inflated, membranous, sac-like involucre, which at length enlarging, contains the ripened nut. Ovary 2-celled, 2-ovuled.

1. *O. Virginica*.

Iron-wood.

Leaves ovate or oblong-ovate, acuminate, sheathing and unequally serrate, petiolate, somewhat pubescent; fertile aments pendulous, whitish, much resembling a cluster of Hops; involucre-scales bristly at base. A small, slender tree, with a finely furrowed bark, and very compact, tough wood. The fertile aments when full grown are about 2' long, and quite showy. Common in rich, moist woods. *April-May*.

6. CARPINUS.

Barren flowers in drooping, cylindrical aments; stamens 8-12, furnished with a roundish, entire, ciliate bract instead of a calyx; filaments very short; anthers bearded at apex. Fertile flowers mostly in twos, each pair with a small, deciduous bract, contained in a large, 3-lobed involucre, all arranged in a loose ament, each flower with a 2-celled, 2-ovuled ovary, terminating in 2 filiform stigmas. Nuts small, ovoid, furrowed, pedicellate, each furnished with an enlarged, open, and leaf-like scale as an involucre. *Trees.*

1. *C. Americana*.

Hornbeam.

Leaves oval or oblong-ovate, acuminate, acutely and unequally serrate, petiolate; fruiting aments drooping, long, loose, with the dark-brown nuts arranged by twos, each with a large, 8-lobed, light-green involucre; middle segment of the involucre the longest. A small tree with smooth, light-green bark, and very compact, fine-grained, tough wood. Common along streams and in low thickets. *April-May*.

ORDER CXII. Myricææ.—Bayberry-tribe.

1. MYRICA.

Flowers diœcious. Barren on oblong, closely imbricated aments, destitute of calyx, each contained in a scale-like bract; stamens 2-8. Fertile flowers in ovoid aments, destitute of calyx, each contained in a scale-like bract. Ovary solitary, with 2 filiform stigmas. Fruit a globular nut, covered with resinous scales. *Shrubs.*

1. *M. Gale*.

Sweet-gale.

Leaves lanceolate, cuneate at base, serrate near the apex, on very short petioles, appearing long after the flowers. Barren aments clustered; scales ovate, cordate, acuminate, ciliate; fruit in dense, oblong heads. A low shrub with a dark-brownish bark. The dark-green leaves, and the fruit when crushed, have a pleasant, spicy odor. Shrub 3-4 ft. high. *April*.

2. *M. cerifera*.

Bayberry.

Leaves smooth, oblong, tapering at base, entire, or with a very few remote teeth toward the apex, petiolate, paler beneath, shining green above, punctate with resinous dots, just preceding the flowers; sterile aments scattered; nuts more or less clustered, covered with wax. A low and very branching shrub, 3-7 ft. high, common in dry, sandy soils, in districts near the coast. The leaves are fragrant, and the hard, globose fruit is covered with a coating of wax. *May*.

2. COMPTONIA.

Flowers monœcious. Barren flowers in cylindrical aments; bracts reniform, cordate, acuminate; stamens 3—6. Fertile flowers in globular aments; calyx-scales 5—6, subulate, surrounding the ovary. Styles 2. Nut ovoid, smooth, 1-celled. *Shrubs.*

1. *C. asplenifolia.**Sweet Fern.*

Leaves linear or linear-lanceolate, pinnatifid with rounded segments, thin, dark-green, numerous, on short petioles, fragrant; stipules semi-cordate, in pairs, acuminate; barren aments erect, oblong; fertile, rounded burrs, situated beneath the barren; nut ovate, brown. A low shrub, 1—8 ft. high, in dry woods and hill-sides. The bark is dark brown, and the young branches are whitish pubescent. The fragrant leaves which follow the flowers somewhat resemble those of Ferns. *April—May.*

ORDER CXIII. Betulacæ.—*Birch-family.*

1. BÉTULA.

Barren flowers in cylindric aments, each bract with 8 flowers, each flower consisting of 4 stamens, and a calyx of 1 scale. Fertile flowers in oblong-ovoid aments, 3 to each bract, with no calyx, each consisting of an ovary with 2 filiform stigmas. Fruit compressed and membranous on the margin. *Trees.*

1. *B. lenta.**Black Birch.*

Leaves ovate, serrate, cordate at base, acuminate, hairy on the veins beneath, as also the petioles; fertile aments oval, erect, somewhat hairy; lobes of the scales obtuse. A fine tree of rather large size, common in forests. The young branches are dark brown, and the inner bark has a pleasant, aromatic flavor. The bark of the trunk is dark brown, and the timber has a reddish tinge, and is used for cabinet-work. *April—May.*

2. *B. excelsa.**Yellow Birch.*

Leaves ovate, acute, tapering, but generally cordate at base, more or less smooth, thin, unequally, coarsely and sharply serrate; fertile aments oblong-ovoid, erect; lobes of the calyx acute. A tall forest tree, most common in the northern districts of N. Eng. and N. York. The young shoots are yellowish, and somewhat aromatic, but less so than in the last. The trunk is covered with a thin, yellowish, silvery bark. *April—May.*

3. *B. papyracea.**Paper Birch.*

Leaves ovate, acuminate, mostly cordate or obtuse at base, doubly serrate, dark green and smooth above, hairy on the veins beneath. A large tree, almost confined to the northern parts of N. Eng. and N. York. The white, tough bark separates from the trunk in thin layers. *April—May.*

4. *B. populifolia.**White Birch.*

Leaves deltoid, with a very long acuminate point, truncate or hearted at base, smooth, and of a bright, shining green on both sides. A very slender and graceful tree, common in rocky and hilly woods and thickets. The white bark readily separates from the trunk, but much less than in the last. The branches are very slender, dark brown, short and numerous. *April—May.*

2. ALNUS.

Barren flowers in long, cylindrical, nodding aments; scales 3-lobed, 3-flowered; flowers with a 4-parted calyx and 4 stamens. Fertile flowers in ovoid aments; bracts fleshy, 2-flowered, 3-lobed; calyx-scales 4, minute, cohering with the other scales of the ament; all persistent. *Shrubs.*

1. *A. incana.**Hoary Alder.*

Leaves broad-oval or ovate, somewhat cordate at base, sharply serrate, sometimes coarsely toothed, mostly white-downy underneath; stipules oblong-lanceolate; fertile aments oval; fruit orbicular. A common shrub, 8—15 ft. high, in thickets, along streams, and in low grounds. N. Eng., northward. *March—April.*

2. *A. serrulata.**Common Alder.*

Leaves obovate, acuminate, tapering at base, sharply and finely serrate, smooth and green on both sides, somewhat pubescent on the veins beneath; fertile aments oblong-oval; fruit ovate. A very common shrub, 6—15 ft. high, in low grounds and along streams, from N. Eng. southward. The barren aments appear long before the leaves. *March—April.*

ORDER CXIV. Salicacæ.—*Willow-tribe.*

1. SÂLIX.

Aments cylindric; bracts entire, 1-flowered. Barren flowers—calyx none; stamens 2—8, rarely 1, accompanied by glands. Fertile flowers each with a gland at base; ovary simple; stigmas 2, short, mostly bifid. *Shrubs and trees.*

* Aments lateral, appearing before the leaves.

1. *S. tristis.**Sage Willow.*

Leaves nearly sessile, narrow-lanceolate, cuneate at base, acute or obtuse, entire or obscurely toothed, woolly on both sides, at last nearly smooth; stipules minute, disappearing very early; aments small, nearly globular when young, loosely flowered; ovaries tapering to a long point, silky-pubescent; style short; stigmas bifid. A common straggling shrub, very branching, of a dull grayish aspect, with gray-downy branches. Stem 10'—15' high. Common in dry woods and fields. The leaves vary according to the soil, being sometimes very small and rigid. *April—May.*

2. *S. humilis.**Low Bush Willow.*

Leaves lanceolate or oblanceolate, abruptly acute or obtuse, petiolate, nearly or quite entire, nearly smooth above, more or less pubescent beneath; stipules usually present, varying from half-ovate to lunate, entire or dentate; style long; stigma bifid. A species equally common with the last, which it much resembles, but is distinguished by its longer-petiolate, stipulate leaves and mostly smooth branches. Stem 3—8 ft. high. *April—May.*

3. *S. discolor.**Bog Willow.*

Leaves lanceolate or oblong-lanceolate, acute, entire at apex, unequally toothed in the middle, somewhat glaucous beneath; stipules half-lunate, dentate; aments large; scales very downy, oblanceolate, acutish, black, very densely and softly pubescent. A shrub or small tree, 6—15 ft. high, common in swamps and low grounds. The young branches are brownish-red, and the young leaves more or less pubescent, but at length they are smooth and glaucous beneath. *April—May.*

4. *S. eriocéphala.**Woolly Swamp-Willow.*

Leaves oblong-elliptical, tapering, sometimes rounded at base, with a few remote, unequal teeth, pubescent on both sides when young, at length green and smooth above, covered below with whitish or rusty pubescence; stipules half-lunate, dentate; aments large, densely flowered, densely clothed with long hairs; ovary on a rather long pedicel, downy. Distinguished from the last, which it resembles, by its dense, far more woolly aments, its pubescent branchlets, and, when in leaf, by the more pubescent leaves. Stem 6—15 ft. high. Common in swamps. *April.*

** Aments appearing with a few minute leaves at base.

5. *S. sericea.**Silky-leaved Willow.*

Branchlets very slender and brittle at base, mostly purplish; leaves lanceolate, acuminate, finely and equally serrate, nearly or quite smooth above, silky-pubescent beneath; stipules deciduous; barren aments small; fertile densely flowered; ovary grayish-silky, ovoid, on a pedicel as long as the rounded, obtuse scale. A common species in wet grounds, 6—10 ft. high, distinguished by its narrow leaves, white-silky beneath, which turn black in drying, and by its slender, purplish branches very brittle at base. *April—May.*

6. *S. petiolaris.*

Branchlets long and slender, usually somewhat brittle at base; leaves lanceolate, acuminate, finely and evenly serrate, smooth above, somewhat silky beneath when young, finely smooth and glaucous; fertile aments loosely-flowered, broader and not so slender as in the last; scales very hairy, scarcely equaling the pedicels of the acuminate, silky ovary. A shrub resembling the last, 6—12 ft. high, distinguished by its full-grown leaves, which are smooth beneath, and its branches, which are purplish or yellowish-green, less slender and straight and less brittle at base, than in the last. *April—May.*

7. *S. viminalis.**Osier. Basket Willow.*

Branchlets very long, straight and slender; leaves linear-lanceolate, very long-acuminate, nearly entire, white beneath, with silky pubescence; aments densely clothed with long hairs; ovary elongated; style filiform; stigmas linear. Cultivated in some districts, and naturalized in wet meadows. A large shrub, 10—15 ft. high, with very long, flexible branches, used for basket-work. The leaves are 8'—8' long. *May.*

8. *S. cordata*.

Heart-leaved Willow.

Leaves lanceolate, or ovate-lanceolate, sharply serrate, acuminate, truncate or cordate at base, smooth, paler beneath; stipules reniform, dentate, sometimes very large and as long as the petioles, and sometimes small; aments appearing with the leaves, furnished with several leafy bracts at base; scales black or brownish, hairy, persistent; ovary pedicellate, smooth, lanceolate, acuminate. A common and variable shrub, 4—15 ft. high, in wet grounds. The leaves vary much in shape and texture, being sometimes narrow and hardly, if at all, truncate or cordate at base. The fertile aments become 2'—3' long in fruit. This species includes several usually described separately. *May*.

*** Aments appearing after the leaves, and terminating the young branchlets just grown.

9. *S. álba*.

White Willow.

Leaves lanceolate or elliptic-lanceolate, acuminate, serrate, more or less silky-pubescent, especially beneath; stipules lanceolate; scales yellowish-green, falling before the fruit ripens; stigma short, recurved, sessile. A moderately tall tree, introduced and naturalized. It is very variable. The most common variety is *Var. VITELLINA*, with long, yellowish shoots. *Var. CERULEA* has leaves of a bluish hue, nearly smooth when grown. *May—June*.

10. *S. frágilis*.

Brittle Willow.

Leaves lanceolate, acuminate, smooth beneath, silky when young, at length smooth and glaucous beneath, on glandular petioles; stipules half-cordate. A tall tree, with smooth and polished branches, extremely brittle at base, cultivated as an ornamental tree, and also for basket-work. It is very variable. *Var. DECIPiens* has the lowest leaves of the branches obovate, obtuse. *Var. RUSSELLIANA* has long, bright leaves, and the extremities of shoots of the season, silky-pubescent in late summer and early autumn.

11. *S. nígra*.

Black Willow.

Leaves narrow-lanceolate, acuminate, tapering at base, serrate, mostly smooth and green on both sides; stipules small, deciduous; aments cylindrical, hairy; stamens 3—6, bearded at base. Varies with very long and falcate leaves, and large, lunate, reflexed stipules. A small tree with a rough, furrowed, blackish bark. The young shoots are very slender and brittle at base. Common along streams. *May—June*.

12. *S. lácida*.

Shining Willow.

Leaves ovate-oblong or ovate-lanceolate, tapering to a long, slender point, serrate, smooth, and bright shining green on both sides, rather thick and firm in texture; stipules oblong, dentate; ovaries smooth; stamens mostly 5. A very elegant shrub, distinguished by its stout, yellowish-green branchlets, and its broad, glossy leaves. Stem 8—15 ft. high. *May—June*.

13. *S. Babylónica*.

Weeping Willow.

Branchlets very long and slender, drooping; leaves lanceolate, acuminate, smooth, glaucous beneath; stipules roundish-oblique, acuminate; ovaries sessile, ovate, smooth. A beautiful tree, universally cultivated, and distinguished by its long, drooping branches. There is a variety with the leaves curled into a circle or ring.

2. PÓPULUS.

Aments cylindrical. Bracts fringed and lobed at apex. Flowers on an oblique, turbinate disk. Stamens 8—30. Style very short. Stigma long, bifid. Aments drooping and preceding the leaves. *Trees*.

1. *P. tremuloides*. *American Aspen. White Poplar.*

Leaves rounded-cordate, abruptly acuminate, dentate, smooth on both sides, pubescent on the margin, dark green, on flattened petioles; scales of the ament cut into several linear segments, fringed with hairs. A common tree in forests, with a smooth, whitish bark. The thin, dilated petioles, being acted on by the slightest disturbance of the air, keep the leaves in continual motion. *April*.

2. *P. grandidentata*.

Large Poplar.

Leaves roundish-ovate, acute, dentate, with large, unequal, sinuate teeth, white-downy beneath when young, at length smooth on both sides; scales of the ament cut into several small, unequal segments, scarcely fringed with hairs. A larger tree than the last, common in woods. Its leaves are destitute of the trembling motion peculiar to the last. *April*.

3. *P. cándicans*.

Balm of Gilead.

Leaves cordate-ovate, acuminate, serrate, whitish beneath, with reticulated

veins and hairy petioles, dark-green; buds resinous. A tree of medium size, common in cultivation, and about houses. The young branches are round, and the bark is smooth and greenish. *April*

4. *P. dilatata*.

Lombardy Poplar.

Leaves deltoid, acuminate, smooth, serrate, as broad as long; trunk furrowed. A tall tree, of regular, pyramidal growth, common in cultivation as a shade tree. *April*.

5. *P. álba*.

Silver-leaf Poplar.

Leaves broad, cordate-ovate, acuminate, lobed and toothed, dark shining-green above, clothed below with dense, white, silky pubescence; fertile aments ovate; stigmas 4. A large tree of rapid growth, cultivated for ornamental purposes. It derives its beauty from the contrast between the upper and under sides of the leaves. *April*.

ORDER CXVI. *Platanaceæ.—Buttonwood-family.*

1. PLÁTANUS.

Barren flowers consisting of numerous stamens, with small scales intermixed. Fertile flowers in separate aments; ovaries clavate, angular; style filiform, simple. Achenia coriaceous, clothed with reddish hairs below, 1-seeded. *Trees*.

1. *P. occidentális*.

Buttonwood.

Leaves large, angular, with acute lobes, downy beneath when young, at length smooth; flowers greenish, in dense, globular heads, on long, drooping peduncles. A very large and noble tree, with whitish branches. The bark scales off in large plates, discovering the white surface beneath, and giving a mottled appearance to the tree. The globular heads of fruit remain attached most of the winter.

ORDER CXVII. *Urticaceæ.—Nettle-tribe.*

SYNOPSIS OF THE GENERA.

SUBORDER I. Mòreæ.

Trees or shrubs with alternate leaves and milky juice, producing fleshy fruits.

1. MòRUS. Fertile flowers in a dense, ovoid or oblong spike, forming a smooth, compound berry.

2. FÍGUS. Flowers arranged on the inside of an obovoid, fleshy, closed receptacle.

SUBORDER II. Cannabínææ.

Herbs with opposite stipulate leaves, and a watery juice. Styles 2.

3. CÁNNABIS. Erect herbs. Barren flowers in cymose panicles. Fertile in sessile spikes.

4. HÉMULUS. Twining herbs. Barren flowers in axillary panicles. Fertile in stroble-like aments.

SUBORDER III. Urticææ.

Herbs with opposite or alternate leaves, and a watery juice. Styles single, or none.

5. ÚRTICA. Calyx of the fertile flowers with 2—4 distinct segments. Stinging herbs.

6. PÍLEA. Calyx of the fertile flowers with 8 distinct segments, and with 8 rudimentary stamens in the form of cucullate scales at base. Smooth, succulent herbs.

7. BENMÉRTIA. Calyx of the fertile flowers tubular, entire, or with 4 lobes.

1. MòRUS.

Flowers monœcious or diœcious, the different kinds in separate spikes. Calyx 4-parted. Stamens 4. Styles 2. Achenia ovate, compressed, contained within the fleshy calyx, the whole forming an oblong, juicy, berry-like fruit. *Trees*.

1. *M. rubra*.

Red Mulberry.

Leaves rough-pubescent beneath, cordate or rounded at base, acuminate, entire, 3—several-lobed; flowers small, often diœcious; fruit dark-red, sweetish. A small tree, not uncommon in N. Eng., but frequent Westward and Southward. *May*.

2. *M. álba*.

White Mulberry.

Leaves ovate, cordate and oblique at base, unequally serrate, often lobed, nearly or quite smooth; flowers greenish, in small, roundish, pedunculate clusters; fruit yellowish-white, sweetish and insipid. A small tree, frequent in

cultivation. The leaves are used to feed silk-worms. *Var. MULTICAULIS* is a shrub with long, rank shoots and very large leaves. *May.*

3. *M. nigra.*

Black Mulberry.

Leaves ovate-cordate, obtuse, often lobed, unequally serrate, rough; flowers greenish; fertile spikes oval; fruit very dark-purple, nearly black, pleasantly sub-acid, with a purple juice. A fine tree, often cultivated for its delicious fruit. *May.*

2. *FICUS.*

Flowers monœcious, attached to the inside of a turbinate receptacle, which is closed and somewhat depressed at summit. Barren flowers, calyx 3-parted; stamens 3. Fertile flowers, calyx 5-parted; ovary 1; seed 1. *Trees.*

1. *F. carica.*

Fig.

Leaves cordate, 3-5-lobed, sometimes undivided, repandly toothed, with obtuse lobes, rough above, pubescent beneath; fruit juicy, purple, varying to whitish and greenish when ripe. The Fig is often reared as a curiosity in house cultivation, where it takes the form of a shrub. The delicious fruit needs no description.

3. *CANNABIS.*

Flowers diœcious. Barren flowers in axillary racemes or panicles; sepals 5; stamens 5. Fertile flowers spicate, clustered; calyx of 1 entire sepal inclosing the ovary. *Herbs.*

1. *C. sativa.*

Hemp.

Stem erect, tall, branching, rough; leaves opposite; upper ones alternate; all digitately parted; leaflets lanceolate or linear-lanceolate, coarsely serrate, dark-green above, paler beneath; flowers green; barren in terminal panicles, fertile in spikes. The Hemp frequently grows as a weed round buildings and waste places generally. It is a tall, weed-like plant, 4-6 ft. high, with very tough, inner bark, used in the manufacture of ropes and coarse cloths. *June. An.*

4. *HUMULUS.*

Flowers diœcious; barren in axillary panicles; sepals 5; stamens 5; fertile in axillary spikes or aments; bracts leafy, imbricated, entire, persistent, 2-flowered; calyx of 1 sepal including the ovary. Achenia invested in the persistent, enlarged calyx, forming a strobile.

1. *H. lupulus.*

Hop.

Stem twining with the sun, rough backwards with reflexed prickles; leaves opposite, cordate, 3-5-lobed or undivided, very rough, on long stalks; stipules ovate, persistent; barren flowers very abundant, greenish, in axillary panicles; fertile in large strobiles or cones, consisting of enlarged, yellowish-white scales. A rough vine in low grounds, twining over bushes and trees, distinguished by its large cones of fertile flowers, which contain a bitter principle, that gives the Hop its value in making beer and yeast. *July. Per.*

5. *URTICA.*

Flowers monœcious or diœcious. Barren flowers. Calyx mostly of 4 sepals; stamens 4. Fertile flowers. Calyx of 2-4 persistent sepals. Achenium compressed, smooth, invested in the calyx. *Stinging herbs.*

1. *U. Canadensis.*

Hemp Nettle.

Stem erect, simple or branching, hispid and stinging, flexuous above; leaves alternate, broad-ovate, acuminate, serrate, rounded, rarely somewhat cordate at base, on long petioles; flowers greenish-white, in loose, axillary, divaricate panicles as long as the petioles, or shorter, upper ones staminate, lower pistillate; calyx of the barren flowers 5-parted. A common, stinging weed, growing in low, rich soils. It sometimes varies with nearly smooth leaves and stem, which is 2-4 ft. high. *Aug.*

2. *U. dioica.*

Nettle.

Stem erect, branching, very hispid and stinging, obtusely 4-angled; leaves opposite, ovate, cordate at base, acuminate, acutely and deeply serrate, pubescent beneath; flowers monœcious or diœcious, in axillary, branching panicle spikes, greenish and homely. A stinging weed, 2-4 ft. high. Common in waste places. *July-Aug.*

6. *PILEA.*

Flowers monœcious, bracted; sterile and fertile often mingled together. Barren flowers of 3-4 sepals; stamens 3-4. Fertile flowers—calyx of 3 sepals, with 3 rudimentary stamens at base; ovary 1; stigma sessile, ending in a little tuft.

1. *P. pumila.*

Richweed.

Stem ascending, simple or branching, succulent, translucent, smooth and glassy; leaves ovate, coarsely serrate, acuminate, chiefly 3-nerved, smooth, on long petioles; flowers greenish, in axillary, corymbose clusters, shorter than the petioles; 4'-10' high. A little weed with a pellucid stem. *July-Sep. An.*

7. *BEHMERIA.*

Flowers monœcious or diœcious. Barren flowers—calyx 4-parted; stamens 4. Fertile, calyx entire, or 4-lobed, tubular. Ovary 1. Style 1, subulate. Achenium compressed, elliptical, inclosed in the persistent calyx.

1. *B. cylindrica.*

False Nettle.

Nearly or quite smooth; stem erect, simple, slender; leaves opposite, sometimes alternate, ovate-lanceolate or oblong-lanceolate, acuminate, serrate, about 3-nerved, on long petioles; flowers minute, greenish, densely crowded in axillary spikes; barren spikes interrupted; fertile spikes cylindric, shorter and thicker. A coarse, homely plant, resembling a Nettle, but destitute of stings. Stem 1-3 ft. high. *July-Sep. Per.*

SUBCLASS II.—GYMNOSPERMÆ.

ORDER CXVIII. Coniferæ.

SYNOPSIS OF THE GENERA.

SUBORDER I. Abietinæ.

Fertile flowers in many-flowered aments, made up of carpellary scales, with 2 ovules at base, and subtended by a bract outside, forming a woody cone in fruit.

1. *PINUS.* Leaves in clusters of 2-5, arising from the same sheath, persistent.

2. *ABIES.* Leaves scattered, single, persistent.

SUBORDER II. Cupressinæ.

Fertile flowers in few-flowered aments, made up of carpellary scales, bearing a few ovules at base, and destitute of bracts, the whole forming a subglobose drupe-like cone in fruit.

3. *THUJA.* Flowers monœcious. Strobile dry when ripe, made up of a few oblong scales.

4. *CUPRESSUS.* Flowers monœcious. Strobile dry when ripe, somewhat woody, consisting of petalate scales.

5. *JUNIPERUS.* Flowers diœcious. Fruit when ripe a somewhat fleshy drupe.

1. *PINUS.*

Flowers monœcious. Barren aments in spikes; stamens numerous, with very short filaments; anthers 2-celled; pollen consisting of 3 united grains. Fertile aments terminating the branches, solitary or clustered, consisting of imbricated scales, each with a deciduous bract outside, and a pair of ovules inside, attached to the base. Fruit a cone, consisting of the woody scales, which are mostly thickened at apex and persistent, spreading when mature and dry. Seeds sunk in hollows at the base of the scales. Cotyledons 3-12. *Trees with acerose leaves.*

1. *P. resinosa.*

Red Pine.

Leaves in pairs, half-cylindrical, elongated, arising from long sheaths; cones ovoid-conical, solitary or several together, half as long as the leaves; scales dilated in the middle, unarmed. A tall species, with smoother and somewhat redder bark than most of the other species. Common in dry woods in Northern N. Eng. and N. York. The leaves are of a dark-green, 5'-6' long, and mostly at the ends of the branches. *May.*

2. *P. rigida.*

Pitch Pine.

Leaves in threes, with short sheaths; cones ovoid-conical, mostly in clusters; scales ending in short, recurved spines. A small tree at the North, but attaining to a great height at the South. Common in sandy soils. The trunk is covered with a thick, rugged and furrowed bark, of a dark-brown color. The wood is very resinous, and makes good fuel. *May.*

3. *P. Strobus.*

White Pine.

Leaves in fives, slender, with very short, deciduous sheaths; cones cylindrical, pendulous, solitary, loose, somewhat curved. A very tall and noble tree, common in rich woods. The timber is light and soft, and is used extensively for building, while the tall, straight, smooth trunks, furnish masts for ships. The slender and graceful branches grow in almost regular verticils, while its delicate, dark-green foliage renders this the most elegant species in the country *May.*

2. ABIES.

Barren aments scattered, or clustered near the ends of the branchlets. Strobile small, round-oblong, with thin, flat scales, not thickened at apex or terminating in a point. Seeds winged. Cotyledons 3—9.

1. A. Canadensis.

Hemlock.

Leaves flat, linear, obtuse, glaucous beneath, mostly in 2 rows; cones ovoid, terminating the branches, a little longer than the leaves; scales few, rounded, entire. A tall, evergreen tree, of elegant growth, in rocky, hilly woods. Common, especially toward the North. The trunk is large and covered with a rough, dark-brown bark. The branchlets are slender, and brittle; the timber is light and soft, but less valuable than that of the pines. *May.*

2. A. nigra.

Black Spruce.

Leaves 4-angled, rigid, short, dark-green; cones pendulous, ovoid; scales undulate, and toothed at the apex. A tall tree, common in the northern districts of N. Eng. and N. York. In growth it assumes a pyramidal form, and is distinguished by its branches and very dark leaves, which thickly cover them. *May.*

3. A. álba.

White Spruce.

Leaves 4-angled, slender, spreading, irregularly scattered, of a light, glaucous green; cones oblong, loose, pendulous; scales broad-obovate, entire. A tall, slender, and elegant species, common in swamps and moist woods, especially in northern N. Eng. and N. York. The trunk is covered with a light-colored bark, and the slender branchlets are often pendulous. *May.*

4. A. balsámea.

Balsam Fir.

Leaves narrow-linear, flat, obtuse, bright-green above, silvery-white beneath; cones erect, large, cylindrical, violet-colored; bracts obovate, appressed. A slender and beautiful fir, common in the cold woods and swamps of northern N. Eng. and N. York. It is of regular pyramidal growth, and is distinguished from the preceding species by the silvery under-surface of the leaves. The trunk is covered with a smooth bark, abounding in receptacles of a peculiar resin or balsam, which is extracted and used for a medicine. *May.*

3. THUJA.

Flowers monœcious, the two kinds on separate branches. Barren flowers in small, ovoid aments; stamens attached by a scale-like filament, with 4 anther-cells. Fertile flowers consisting of a few loose scales, each bearing 2 erect ovules at the base inside. Seed winged. Cotyledons 2.

1. T. occidentális.

Arbor-vitæ.

Leaves rhomboid-ovate, appressed, imbricate in 4 rows on the 2-edged, flat branchlets; cones nodding, oblong; scales without joints, 1-seeded; seeds with broad wings. An evergreen tree of straggling, irregular growth, common in swamps in northern N. Eng. and N. York. The trunk is crooked, and diminishes in size very rapidly. The foliage is peculiarly aromatic and fragrant, a quality, however, which is mostly lost when cultivated, as it often is for hedges. *May.*

4. CUPRESSUS.

Flowers monœcious, the two kinds on separate branches. Barren flowers in ovoid aments; scales peltate, bearing 2—6 anther-cells. Fertile flowers in globular aments; scales peltate, in 4 rows, bearing several erect ovules at base. Cone globular, not opening till mature. Seeds compressed, winged. Cotyledons 2—3.

1. C. thyoides.

White Cedar.

Leaves ovate, with a gland on the back, imbricated in 4 rows on the compressed branchlets, minute, dull-green. A moderately large tree in swamps, from N. Eng. southward. It is quite regular in its growth, and is distinguished from Thuja, which is often confounded with it, by the dull-green, minute leaves, and the small, compact, globular cones.

5. JUNÍPERUS.

Flowers diœcious, sometimes monœcious, in very small aments. Barren aments—scales peltate, bearing 3—6 anther-cells on their lower margin. Fertile aments globose; scales few, fleshy, adhering at base, bearing 1—3 ovules, forming in fruit a scaly berry containing 2—3 bony seeds. Cotyledons 2.

1. J. communis.

Juniper.

Leaves linear, subulate, spreading, mucronate, bright-green below, glaucous and paler above; barren flowers in small, axillary aments; fertile flowers axil-

lary, sessile, in small, globular cones; berries round-cylindrical, dark-blue, and of a sweetish-turpentine taste. A shrub with rigid branches, prostrate on the ground, rarely erect and tree-like.

2. J. Virginiana.

Red Cedar.

Leaves in 4 rows, crowded in pairs or threes, on young or rapidly growing shoots, subulate, in other cases very small, triangular-ovate, closely imbricated; barren flowers in small, oblong aments; berries small, blue, with a glaucous bloom. A very small tree, of irregular growth, known in N. Eng. as *Savin*. The trunk diminishes rapidly in size, with crowded, horizontal branches. The wood is reddish and fragrant, very compact and lasting. Sometimes it appears as a shrub with prostrate branches. *April—May.*

CLASS II.—ENDÓGENÆ.

ORDER CXIX. Araceæ.—*Arum-tribe.*

SYNOPSIS OF THE GENERA.

* Flowers all perfect.

4. *ACORUS*. Spathe none. Spadix lateral, borne on an ensiform scape. Sepals 6. Stamens 6.

5. *SYMPLOCARPUS*. Spathe present. Spadix from the root. Sepals 4. Stamens 4.

** Flowers monœcious or polygamous.

1. *ARUM*. Flowers monœcious, rarely polygamous. Spadix naked toward the summit, with the pistillate flowers at base, and the staminate flowers above them.

2. *PELTÁNDRA*. Flowers monœcious, covering the spadix; lower ones pistillate, upper staminate.

3. *CALLA*. Flowers covering the spadix, the lower ones perfect, the upper usually entirely staminate.

1. *ARUM*.

Flowers mostly monœcious, rarely polygamous-diœcious, situated at the base of a spadix, which is naked above. Fertile flowers below. Barren above, inclosed in a cucullate spathe, convolute at base. Perianth none. Berries distinct, 1-celled, several-seeded. *Per.*

1. A. triphýllum. *Wake-robin. Indian Turnip.*

Acaulescent; leaves mostly 2, on long petioles, sheathing at base, ternate; leaflets ovate or oval, acuminate, sessile; spadix shorter than, and included within the ovate, acuminate spathe, which is flattened and bent over the top of the spadix, and is frequently marked with dark purple or whitish spots or stripes, otherwise of a dark, shining green. A well-known plant, common in rich, rocky woods. Scape 6'—12' high, arising from a globular, fleshy, rugose corm, situated beneath the surface. This bulb possesses an intense acidity, which disappears by drying or heat. The fruit is a bunch of bright red berries, ripe in autumn. *May.*

2. *PELTÁNDRA*.

Flowers monœcious, covering the long spadix. Spathe elongated, convolute, undulate on the margin. Perianth none. Anthers on the upper part of the spadix, sessile, peltate. Ovaries at the base of the spadix. Berries distinct, 1-celled, 1—3-seeded. *Per.*

1. P. Virginica.

Arrow Arum.

Acaulescent; leaves oblong-sagittate, acute at apex, with obtuse lobes, on long petioles, dark, shining green, of large size; spathe elongated, curved at apex, dark green, enveloping the slender spadix; ovaries sessile, in dense clusters at the base of the spadix, becoming a bunch of green berries. An elegant water plant, 10'—18' high, distinguished by its large, sagittate, shining, dark green leaves, and its green, clustered berries. *June—July.*

3. *CALLA*.

Spathe ovate, spreading, persistent. Spadix covered with flowers, the lower perfect, the upper often entirely staminate. Perianth none. Berries distinct, several-seeded.

1. C. palústris.

Wild Calla.

Acaulescent; rhizoma creeping, rooting at the joints; leaves cordate, acuminate, involute at the extremity, on long petioles; scape solitary, green and thick; spathe clasping at base, recurved, greenish or yellowish, white within; berries in a small cluster, red and juicy when ripe. A low herb in cold swamps, with a creeping rhizoma, pervaded, as is usual in the order, with an acrid principle. Scape 3'—8' high. Common in the northern districts. *June—July.*

2. *C. Æthiopia*.*Ethiopian Calla.*

Acaulescent; leaves sagittate, cordate at base, on long, sheathing petioles, shining green, very large and smooth; spathe cucullate, convolute at base, recurved, abruptly long-acuminate, very large, bright white, about twice as long as the yellow spadix. A fine plant, common in house cultivation, and much admired for its large, white spathe. Scape 2–4 ft. high. *Jan.—May.*

4. *ÁCORUS.*

Spathe none; spadix lateral, sessile, densely flowered. Flowers perfect. Sepals 6. Stamens 6. Anthers reniform. Stigma sessile, minute. Ovaries 2–3-celled, becoming dry and few-seeded. *Per.*

1. *A. Calamus.**Sweet Flag.*

Rhizoma creeping; leaves long, ensiform, light green; scape long, ensiform, resembling the leaves, bearing the sessile spadix on its edge, just above the middle; spadix covered with yellowish-green flowers. A common plant in wet grounds. The aromatic pungency of the thick and creeping rhizomas is well known. The scape and leaves are 2–3 ft. high, distinguished by their light-green color, and the central ridge extending the whole length. *June—July.*

5. *SYMPLOCÁRPUS.*

Spathe ventricose, cucullate, acuminate, with an incurved point, fleshy, decaying soon after flowering. Spadix pedunculate, oval, entirely covered with the perfect flowers. Sepals 4, cucullate, persistent, at length thick and spongy. Stamens 4. Style 4-angled. Stigma minute. Seeds large, globular, imbedded in the enlarged, spongy spadix.

1. *S. fœtidus.**Skunk-Cabbage.*

Acaulescent; leaves ovate, cordate at base, acute, on short petioles, at length very large; spadix preceding the leaves, enveloped in a spathe, striped with purplish-brown; flowers crowded on the spadix, dull-purple. A very common plant in swamps and wet meadows, sufficiently marked by its well-known offensive odor, resembling that of a skunk. Its spotted spathes appearing just above the surface, are among the first evidences of approaching spring. The clustered leaves soon become very large, being 10'–12' broad, and somewhat longer. *March—April.*

ORDER CXX. Typhaceæ.—Cat-tail-tribe.

1. *TYPHA.*

Flowers in a long, terminal, cylindrical spike, upper part staminate. Stamens intermingled with hairs, with 3 anthers on a common filament. Ovaries below, pedicellate, surrounded by numerous bristles, forming a sort of pappus to the seed. *Per.*

1. *T. latifolia.**Cat-tail.*

Stem erect, simple; rhizoma creeping; leaves ensiform, nearly flat; barren and fertile spikes contiguous, mostly forming one long, compact, cylindrical spike, turning brownish in fruit. A common plant in swamps, distinguished by its long-ensiform leaves, and its long, brown spikes. Stem 3–5 ft. high. *July.*

2. *SPARGÁNIUM.*

Flowers in separate, globose heads, with leafy bracts; upper ones barren, consisting of stamens alone, mingled with small scales; lower fertile; ovaries surrounded by 3–6 calyx-like scales. Fruit turbinate, 1–2-celled, 1–2-seeded. *Per.*

1. *S. ramosum.**Burr-reed.*

Stem erect, branching above; leaves linear, triangular at base, with concave sides; flowers in globular clusters, resembling burrs, of a whitish-green, lowest mostly pedicellate; stigma linear, longer than the style, often 2. A common plant, with somewhat grassy leaves and a reedy stem, 2–3 ft. high, and, like the other species, distinguished by its globular burrs of flowers. It grows around ponds and in ditches. *July—Aug.*

2. *S. Americanum.**Small Burr-reed.*

Stem erect, nearly or quite simple; leaves nearly equalling the stem, triangular at base, with flat sides; fertile heads 2–4, sessile; stigma oblong, oblique, scarcely half the length of the style. A smaller and more slender species, common along streams and the borders of ponds. Stem 1–2 ft. high. *Aug.*

ORDER CXXII. Naiadaceæ.—Pond-weed-family.

SYNOPSIS OF THE GENERA.

* *Flowers perfect.*

2. *RÚPIA.* Flowers 2–5, on a slender, pedunculate spadix. Perianth none. Stamens 2, each with 2 distinct anther-cells.

3. *POTAMOGETON.* Flowers in more or less dense, pedunculate spikes. Sepals 4. Stamens 4, with 2-celled anthers.

* * *Flowers monœcious or diœcious.*

1. *NÁJAS.* Flowers axillary, solitary. Stamen 1, furnished with a little spathe.

1. *NÁJAS.*

Flowers monœcious or diœcious, axillary, solitary. Barren flowers—stamen 1, enveloped in a little spathe. Fertile—style 1, short; stigmas 2–4-subulate; ovary 1. Achenium 1-seeded, inclosed in a loose, and easily separated membranous sheath.

1. *N. Canadensis.**Water Nymph.*

Aquatic; stem very slender, dichotomously branched; leaves opposite or whorled, very narrowly linear, sheathing at base; flowers minute, axillary. A very slender plant, growing in tufts wholly under water. Common in ponds and slow waters. Stem 5'–20' long. *July—Sep.*

2. *RÚPIA.*

Flowers perfect, 2 or more together on a slender spadix, whose peduncle is much elongated and filiform in fruit, proceeding from the sheathing base of the leaves. Perianth none. Stamens 2, each with 2 large, separate anther-cells. Ovaries 4, sessile. Achenia 4, pedicellate. *Per.*

1. *R. marítima.**Ditch-grass.*

Marine-aquatic; stems filiform, dichotomously branching, floating; leaves linear, very long and narrow, with an inflated, sheathing base, immersed; peduncles of the fruit capillary, 1'–2' long. A very slender, grass-like plant, common in the shallow waters of bays. Stems 2–5 ft. long. The flowers expand at the surface. *June—Aug.*

3. *POTAMOGETON.*

Flowers perfect, spicate. Sepals 4. Stamens 4. Anthers 2-celled. Ovaries 4. Achenia 4, sessile, flattened on the inner side. *Floating aquatics. Per.*

* *Leaves partly floating and partly immersed.*1. *P. natans.**Broad-leaved Pond-weed.*

Stem nearly or quite simple; upper leaves ovate or broadly elliptical, varying to oblong-lanceolate, rounded or cordate at base; immersed ones lanceolate, linear or capillary, all on long petioles; spike of purplish flowers raised above the water. A common aquatic, distinguished from the following species of this section by its long petioles, and its simple, rather stout stems and large floating leaves, 2'–3' long. The immersed leaves are sometimes reduced by decay to mere petioles. Ponds and slow waters. *July—Sep.*

2. *P. heterophyllus.* *Various-leaved Pond-weed.*

Stems slender, mostly branched below; upper leaves oval, oblong or wedge-lanceolate, on long petioles; immersed ones lanceolate, varying to narrow-linear, or even capillary; lower ones sessile; spikes cylindrical, somewhat loose, on long peduncles thicker than the stem. A much more delicate species than the preceding, and quite variable in its forms. Common in shallow, stagnant, and slow waters. *July—Aug.*

3. *P. hybridus.**Slender Pond-weed.*

Stems branching below, very slender; floating leaves oval or oblong-lanceolate on petioles scarcely as long as the lamina; immersed leaves capillary; spike few-flowered, somewhat globular, on a very short peduncle. A very slender and delicate species, growing in water 1–2 ft. deep. Common. *July.*

* * *Leaves all immersed and similar.*4. *P. lucens.**Shining Pond-weed.*

Stem branching; leaves oval-lanceolate, large, flat, acuminate, tapering at base to a very short petiole, thin and shining, especially when dry; spike crowded with greenish flowers, on a long peduncle thickened upwards. A common species in ponds and deep rivers, distinguished by the large and long leaves varying in length 2'–5', or even more. *July—Aug.*

5. *P. perfoliatus*. *Clasping Pond-weed.*

Stem branching dichotomously; leaves alternate, ovate or lance-ovate, sometimes broad-ovate, obtuse, cordate and clasping at base; spike purplish, loosely-flowered, on a short peduncle. A common species in stagnant waters, distinguished by its almost perfoliate leaves. Stem varying in length according to the depth of water. *July—Aug.*

ORDER CXXIII. Alismaceæ.—*Water-Plantain-family.*

1. ALISMA.

Flowers perfect. Stamens 6. Ovaries numerous, arranged in a circle. Achenia compressed, coriaceous.

1. *A. Plantago*. *Water Plantain.*

Leaves oval or ovate, varying to oblong, or even lanceolate, acuminate, on long petioles, 3—9-nerved; flowers in a loose, verticillately-branching panicle; petals small, deciduous, white, with a purplish tinge, longer than the green sepals. A very common plant in wet grounds, with smooth leaves somewhat resembling those of the common Plantain. The scape terminates in a long, compound panicle, and grows 1—2 ft. high. *July—Aug. Per.*

2. SAGITTARIA.

Flowers monœcious, rarely diœcious. Stamens numerous. Ovaries many, aggregated in a spherical head, and forming in fruit a globose head of compressed, winged achenia. *Per.*

1. *S. sagittifolia*. *Arrowhead.*

Scape simple, sheathed at base by the petioles, acanlescent; flowers in verticils of 3; sterile ones at the summit of the scape, fertile ones below; petals white; leaves extremely variable, generally triangular with sagittate lobes, varying from very broad to very narrow. In this state the scape is 1—2 ft. high, and the petioles nearly as long. In other forms, which grow especially in muddy grounds that are frequently overflooded, the leaves are oval or oblong, with thick, spongy petioles, and sometimes nothing but petioles. In this state the plant is 3'—12' high, with the petioles and scape often very large and thick for the size of the plant. Again, the leaves are linear, and the scape and petioles very slender. The height of this variety varies from 2'—12'. Common in wet grounds. *June—July.*

3. TRIGLOCHIN.

Sepals and petals nearly alike, concave, greenish, deciduous. Stamens 6. Filaments very short. Anthers large, oval. Pistils 3—6, forming a compound ovary of 3—6 cells. Stigmas sessile. Capsule clavate, dividing at length into 3—6 indehiscent, 1-seeded carpels.

1. *T. maritimum*. *Arrow-grass.*

Scape naked, fleshy, angled; leaves very narrowly linear, fleshy, semi-cylindric, shorter than the scape; flowers small, green, pedicellate, arranged in a long, loose raceme, destitute of bracts; fruit ovate, composed of 6 carpels, rounded at base. A little rush-like plant, common in salt marshes. Scapes 8'—15' high, arising from creeping rhizomas. *Aug. Per.*

ORDER CXXV. Orchidaceæ.—*Orchis-family.*

SYNOPSIS OF THE GENERA.

*** Lip with a spur at base distinct from the ovary.**

2. *ORCHIS*. Anther-cells parallel. Pollen-granules united to form 2 large masses attached by pedicels to the glands of the stigma, which are inclosed in a little hood. Flowers on a scape.

4. *GYMNADENIA*. Anther-cells parallel. Pollen-masses 2, pedicellate, attached to the 2 glands of the stigma, which are not inclosed in any hood or covering. Stem leafy.

5. *PLATANThERA*. Anther-cells divergent at base. Pollen-masses pedicellate, attached to the 2 glands of the stigma, which are not inclosed in a hood. Stem leafy.

**** Lip not inflated. Spur mostly absent, when present cohering to the top of the ovary.**

† Lip not bearded.

1. *LIPARIS*. Petals linear or filiform. Spur none. Pollen-masses 4, parallel. Leaves 2, at base of the scape.

2. *CORALLORHIZA*. Petals nearly oblong. Lip usually with a short spur adherent to the top of the ovary. Pollen-masses 4, oblique. Plants destitute of green herbage.

9. *SPHAKNTHIA*. Lip tapering to a short claw, and furnished with 2 callous processes just above the claw. Column arching on a short, oblique pedicel. Pollen-masses 2. Flowers mostly in spiral spikes.

10. *GOODYERA*. Lip sessile, saccate at base, entire. Column straight. Pollen-masses 2. Leaves reticulated.

†† Lip bearded.

6. *ARETHUSA*. Sepals and petals united at base. Lip on the lower side of the flower. Pollen-masses 4, 2 in each of the 2 anther-cells, made up of little grains. Scape mostly leafless in flower, afterward 1-leaved.

7. *POGONIA*. Petals and sepals distinct at base. Lip on the lower side of the flower. Column not winged at apex. Pollen-masses 2, 1 in each cell, farinaceous.

8. *CALOPOGON*. Petals and sepals distinct at base. Lip on the upper side of the flower, bearded near the summit, tapering to a claw. Column winged at apex. Leaf 1, grass-like.

***** Lip inflated.**

11. *CYPRIPEDIUM*. Lip a large, inflated, reticulated sac.

1. *LIPARIS*.

Sepals nearly equalling the petals. Petals linear, or filiform. Lip spreading, flat. Column elongated, winged at apex, incurved. Pollen-masses 4, parallel to each other.

1. *L. lilifolia*. *Tway-blade.*

Acaulescent; leaves 2, ovate, sheathing at base; petals filiform, reflexed; lip obovate, abruptly acute, large, brownish-purple. A low plant, with a simple scape arising from a solid bulb, and bearing a slender raceme of a few rather large, purplish flowers. Scape 2'—5' high. Not rare in moist woods, especially in the Middle States. *June.*

2. *CORALLORHIZA*.

Sepals and petals nearly equal; lateral ones erect; upper vaulted. Lips spreading and recurved, usually produced behind into a short spur, which adheres to the top of the ovary. Pollen-masses 4, oblique to each other. *Leafless.*

1. *C. multiflora*. *Coral-root.*

Scape many-flowered; lip cuneate, oval, 3-lobed, spotted with bright purple; middle lobe recurved, much longer than the lateral, tooth-like lobes; spur conspicuous; capsule and ovary oblong. A curious, leafless plant, 12'—18' high, with a brownish-purple scape, furnished with a few bracts and rather large, brownish flowers. The scape arises from a creeping, very branching and much-toothed rhizoma, resembling somewhat pieces of coral. Common in rich woods; probably parasitic on the roots of trees. *July—Aug.*

3. *ORCHIS*.

Flower ringent. Sepals and petals nearly equal, most of them converging and vaulted. Lip depressed, attached to the base of the column, and terminating in a spur distinct from the ovary. Anthers all parallel, close together. Pollen in small grains combined in 2 large masses, each pedicellate, and attached to the base of the 2 glands of the stigma, which are both inclosed in a little covering, or hood.

1. *O. spectabilis*. *Showy Orchis.*

Acaulescent; scape low, with about 5 acute angles; leaves few, mostly 2, nearly as long as the scape, oblong-obovate, somewhat thick in texture, of a shining green; flowers large, few, showy; bracts lanceolate, acute, large and leaf-like; petals and sepals arched, mostly pink, rarely white; lip white, entire; spur obtuse, white. A very pretty and showy little plant, 8' high, common in rich, rocky woods. *May.*

4. *GYMNADENIA*.

Flower ringent. Sepals and petals nearly equal, mostly converging and vaulted. Lip depressed, attached to the base of the column, terminating in a spur distinct from the ovary. Anther-cells parallel. Pollen-masses 2, pedicellate, attached to the 2 glands of the stigma, which are naked, and not contained in any covering.

1. *G. tridentata*. *Naked Orchis.*

Stem slender, bearing a comparatively large, oblong or oblong-ovate, obtuse leaf toward the base, and several smaller ones resembling bracts above; flowers small, greenish, rather numerous, in a short, oblong spike; lip truncate, 8-toothed, cuneate-oblong; spur slender, curved upward, clavate, longer than the ovary. A slender plant, distinguished by its single, large, nearly radical

leaf, much larger than the upper, bract-like ones. Stem 5'—10' high. Not uncommon in wet woods and swamps. *July*.

5. PLATANTHÈRA.

Flower ringent. Petals and sepals nearly equal; upper ones vaulted; lateral ones spreading. Lip depressed, attached to the base of the column, tapering at base to a spur distinct from the ovary. Anther-cells 2, diverging at base. Pollen-masses pedicellate, and attached to the 2 glands of the stigma, which are not inclosed in a covering, and are widely separated.

1. *P. flava*.*Yellow Orchis*.

Stem leafy, somewhat flexuous; leaves ovate-oblong, acute, varying to lanceolate and linear-lanceolate, acuminate above; flowers small, dull-greenish-yellow, in a long, cylindrical spike, at first dense and at length loose; bracts except the uppermost, longer than the flowers; petals ovate; lip oblong, obtuse, toothed on each side near the base; palate with a tuberculous protuberance; spur filiform, clavate, shorter than the ovary. A small, inelegant species, common in wet grounds. Stem 8'—15' high. *June—Aug.*

2. *P. lacera*.*Ragged Orchis*.

Stem leafy; leaves oblong or lanceolate; flowers whitish-yellow or greenish-white, longer or shorter than the bracts, in a loose, cylindrical raceme; petals linear, entire; lip 3-parted, tapering to a claw at base; segments narrow, and deeply cut into long and very fine divisions; spur filiform, as long as the ovary. A common and homely plant, growing in moist meadows and thickets. Stem 1—2 ft. high. Distinguished by its greenish flowers, fringed lip and entire petals. *July*.

3. *P. psycodes*.*Small-fringed Orchis*.

Stem leafy, angled; leaves oblong or ovate-lanceolate, upper ones lanceolate; flowers small, purple, fragrant, in a dense, many-flowered, cylindrical raceme; lower sepals roundish-elliptical, obtuse; petals cuneate-obovate or spatulate, somewhat toothed at the extremity; lip 3-parted, tapering at base to a claw; segments broad-cuneiform, fimbriate with short, fine fringe; spur longer than the ovary. A very handsome species, 1—2 ft. high, common in wet meadows. Distinguished by its rather small, purple flowers, and short-fringed lip. *July—Aug.*

4. *P. fimbriata*.*Fringed Orchis*.

Stem leafy, angled; leaves oval, varying to oblong-lanceolate above; flowers large, loosely arranged in a cylindrical raceme, and furnished with lanceolate bracts, pale purple; lower sepals ovate, acute; petals oblong, fringed; lip very large, dependent, 3-parted, somewhat triangular in outline, deeply fimbriate with long, capillary fringe; spur longer than the ovary. A noble species, growing in swamps and meadows; distinguished from the last by its fewer, much larger, and paler flowers, the much larger, long-fringed lip, and the earlier flowering. Stem 2—3 ft. high. Not very common southward; frequent in Northern N. Eng. and N. York. *June*.

6. ARETHUSA.

Flowers ringent. Sepals and petals lanceolate, nearly equal, cohering at base, arched over the column. Lip destitute of spur, spreading and recurved toward the extremity, bearded inside. Column dilated, attached at base to the lip. Anther-cells 2, approximate. Pollen-masses 4; 2 in each cell, angular, made up of grains.

1. *A. bulbosa*.*Arethusa*.

Mostly leafless in blossom; scape low, sheathed, arising from a round bulb, and bearing a single, large, fragrant, purple flower. The sheaths contain a linear leaf, which sometimes appears with the flower, but generally follows it, pushing out from its sheath. A very beautiful flower growing in bogs. Scape 4'—5' high, bearing a flower 2' long. *May*.

7. POGONIA.

Flowers ringent. Sepals and petals somewhat spreading, not united at base. Lip crested or 3-lobed, bearded inside. Column clavate, not winged at apex. Anther pedicellate. Pollen-masses 2, 1 in each cell, farinaceous.

1. *P. ophioglossoides*. *Adder's-tongue Arethusa*.

Stem slender, 1-leaved and 1-bracted; leaf situated at the middle of the stem, oval or lanceolate, clasping; bract situated above, similar in shape, but smaller; flowers mostly solitary, rarely 2—3, large, pale purple or pink, somewhat nod-

ding; lip spatulate, fimbriate, bearded, as long as the petals. A very pretty little plant, common in meadows and bogs. *June—July*.

8. CALOPOGON.

Sepals and petals nearly equal, distinct at base. Lip on the upper side of the flower, tapering to a claw or stalk, expanded at summit, bearded above. Column free, winged at apex. Pollen-masses 2, angular.

1. *C. pulchellus*.*Grass Pink*.

Scape slender, 1-leaved, several flowered, arising from a solid bulb; leaf linear, grass-like, velvety, sheathing the base of the scape; flowers large, bright reddish-purple, fragrant, 2—4 in number; bracts minute; sepals and petals expanded, ovate-lanceolate, acute; lip concave, dilated at summit, bearded inside, with yellowish and purplish, thickened veins. A very beautiful plant, common in meadows and bogs, distinguished by the anomalous position of the lip, which is placed in the upper part of the flower, with the column in the lower portion, causing it to appear inverted. Stem 8'—12' high. *July*.

9. SPIRANTHES.

Flowers somewhat ringent, in a mostly spiral spike. Upper sepal cohering with the petals. Lip oblong, concave, including the lower part of the column, tapering at base to a short claw, and furnished with 2 callous processes just above the claw, somewhat dilated at apex. Column arching, clavate, on a short, oblique pedicel. Stigma beaked, at length 2-cleft. Pollen-masses 2, composed of scarcely cohering grains.

1. *S. gracilis*.*Slender Ladies' Tresses*.

Scape very slender, smooth; leaves all radical, ovate, or oval-lanceolate, petiolate, mostly withered before flowering; flowers small, pearly-white, arranged in a single row, which is sometimes straight, but usually winds spirally round the axis; bracts ovate, acute; lip narrow-obovate, crisped at the summit. A curious little plant, 6'—12' high, common in dry fields and hilly woods, distinguished by its spiral spikes of pearly-white flowers. The scape usually appears leafless on account of the early disappearance of the leaves. *July—Aug.*

2. *S. cernua*.*Ladies' Tresses*.

Stem rather stout, pubescent above; radical leaves linear-lanceolate; those of the stem of the same shape but smaller; flowers whitish or cream-color, larger than in the last, crowded in a dense spike, fragrant, somewhat pubescent; bracts ovate-lanceolate, acuminate, as long as the flowers; lip oblong, dilated and crisped at apex. A stouter species than the last, with persistent leaves. Common in wet ground. Scape 7'—15' high. Radical leaves very long. *Aug.—Oct.*

10. GOODYERA.

Flowers ringent. Upper sepal cohering with the petals, vaulted. Lower sepals situated beneath the lip, which is sessile, saccate at base and entire. Column straight. Pollen-masses 2, composed of angular grains held together by a web.

1. *G. pubescens*.*Rattlesnake Plantain*.

Scape pubescent; leaves all radical, in tufts, ovate, petiolate, dark-green, veined and blotched with white; flowers small, greenish-white, like the scape glandular-pubescent, arranged in a dense spike; the roundish, inflated lip ovate, ending in an abrupt point. A curious plant, common in rich woods, well marked by its white-veined and spotted leaves, from which its common name is derived, probably from some fancied resemblance between its colors and those of the snake. Scape 6'—12' high. *July—Aug.*

11. CYPEPEDIUM.

Sepals spreading; the 2 lower or forward ones united into 1 below the lip, rarely distinct. Petals alike, but mostly narrower. Lip a large, inflated, obtuse sac, which may be compared to a shoe or slipper. Column 3-lobed; lateral lobes anther-bearing; middle lobe dilated and petaloid, incurved. Pollen composed of soft granules.

1. *C. parviflorum*. *Yellow Lady's Slipper*.

Stem leafy, pubescent; leaves oval, acuminate, strongly parallel-veined, pubescent; flowers large, mostly solitary; sepals ovate, or ovate-lanceolate, acuminate; petals elongated, linear, contorted, greenish, striped and spotted with brownish-purple; lip large, inflated, yellow, spotted inside, with a rounded aperture on the upper side; lobe of the column triangular. A curious and very showy

plant, not uncommon in moist, rich woods. Stem 10'—20' high. The large, inflated lip is 2' long. *May—June.*

2. *C. acaille.**Lady's Slipper.*

Acaulescent; stem naked, 2-leaved at base, 1-flowered; leaves oval or oblong, acute, strongly veined, pubescent; flower large, bracted; sepals oblong-lanceolate, acuminate; petals linear; lip dependent, purple, reticulate, longer than the petals, opening by a fissure on the upper side extending to the extremity; middle lobe of the column rhomboidal, acuminate, deflexed. A fine, showy plant, distinguished by its 2 solitary, radical leaves and naked scape, as well as by its purple lip, which is 1'—2' long. Common in moist, and especially in evergreen woods. Scape 6'—12' high. Varieties occur with the lip pure white. *May—June.*

ORDER CXXVI. Hæmotoraceæ.—Bloodwort-family.

1. ALÆTRIS.

Perianth tubular, rugose, mealy in appearance, 6-cleft at summit. Stamens 6, inserted below the lobes. Style subulate, 3-cleft at apex. Capsule opening at top by 3 valves, many-seeded, inclosed in the persistent perianth.

1. *A. farinosa.**White Star-grass.*

Root fibrous; scape naked, long and slender; leaves lanceolate, thin, in a flat tuft at the base of the scape; flowers oblong, tubular, white, pedicellate, in a long, terminal raceme; bracts subulate, minute. A common plant in sandy woods and meadows, distinguished by its long raceme of white flowers, that look as if meal had been sifted over them. Stem 2—3 ft. high. The root is very bitter and is used in medicine. *July.*

ORDER CXXVII. Amaryllidaceæ.—Amaryllis-family.

SYNOPSIS OF THE GENERA.

* Flowers more or less nodding.

1. AMARYLLIS. Perianth irregular, with six unequal segments. Stamens decinate.

2. NARCISSUS. Corolla regular, furnished with an entire crown at throat.

3. GALANTHUS. Perianth regular, with a crown at throat, consisting of 8 emarginate segments.

** Flowers erect.

4. HYPÓXIS. Perianth 6-parted, persistent. Flowers in a sort of umbel, yellow. Leaves grassy.

1. AMARYLLIS.

Perianth 6-parted, nodding, somewhat funnel-shaped; segments petaloid, nearly similar, somewhat unequal. Stamens 6, inserted at the throat. Capsule 3-parted. Seeds flat, numerous.

1. *A. formosissima.**Jacoba Lily.*

Acaulescent; scape 1-flowered; leaves linear, or narrow-oblong, thick; flower large, nodding, of a brilliant dark-red; segments very much spreading, more or less recurved; tube fringed; spathe red. A very showy bulbous plant, frequently cultivated. The scape is about a foot high, bearing a large flower, 2'—3' long. *June—Aug.*

2. NARCISSUS.

Perianth of 6 equal divisions, furnished with a crown at the throat, consisting of a whorl of sterile stamens completely united in a tube, which is funnel-form and entire. Fertile stamens 6, inserted within the crown. *Root bulbous.*

1. *N. Jonquilla.**Jonquille.*

Scape slender, 1—2-flowered; leaves narrow-ensiform; flowers large, rich yellow, very fragrant, rising from a long, compressed, deciduous spathe, which opens on one side; segments of the perianth spatulate, reflexed; crown shorter than the segments, flat, shallow and somewhat like a saucer, spreading, crenate. A very handsome species, frequent in cultivation. Scape a foot high. *May—June.*

2. *N. poeticus.**Narcissus.*

Scape 1-flowered; leaves linear, as long as the scape; flower large, mostly white, fragrant; segments imbricated at base, reflexed; crown expanded, flat,

crenulate, white variegated with circles or rings of crimson and yellow; anthers shorter than the tube. An elegant species, a foot high, much admired in cultivation. *June.*

3. *N. pseudo-Narcissus.**Daffodil.*

Scape erect, 2-edged, striate, 1-flowered; leaves linear, striate; flower very large, sulphur-yellow; crown very long, cup-shaped, serrate on the margin. A common and showy garden plant, distinguished by its 2-edged scape, and very long crown. *April—May.*

3. GALANTHUS.

Flowers arising from a spathe. Perianth 6-parted, outer segments concave; tube furnished with a crown of 3 small, emarginate segments.

1. *G. nivālis.**Snow-drop.*

Stem usually 2-leaved near the summit, 1-flowered; leaves linear, carinate, acute; cauline ones very long and narrow; flower large, nodding, snow-white. A very pretty little plant, 3'—5' high. Common in gardens, where it blooms among the earliest in *April.*

4. HYPÓXIS.

Perianth persistent, 6-parted, spreading. Stamens 6. Capsule crowned with the withered perianth, narrowed at base. Seeds roundish, covered with a black, crustaceous coating.

1. *H. erecta.**Star-grass.*

Hairy, acaulescent; scape 1—4-flowered; leaves linear, grassy, longer than the scape; flowers in a sort of umbel, each with a minute bract at base; segments hairy, yellow within, greenish without. A pretty little plant, common in meadows and grassy fields. Scape usually several from the same solid bulb, 3'—6' high. *June—July.*

ORDER CXXVIII. Iridaceæ.—Iris-family.

SYNOPSIS OF THE GENERA.

* Perianth with 6 unequal segments.

1. IRIS. Three outer segments of the perianth reflexed, larger than the 3 inner, erect ones. Stamens 3. Stigmas 3, petaloid.

2. IRIODIA. Flower rising from a 2-leaved spathe; 3 outer segments larger than the 3 inner. Stamens 6. Filaments united in a tube.

** Perianth with 6 equal segments.

3. SISYPHIUM. Perianth somewhat campanulate, rising from a 2-leaved cauline spathe. Stamens monadelphous.

4. CRÖUS. Perianth funnel-form, arising from a radical spathe, with a very long, slender tube.

1. IRIS.

Perianth 6-cleft, 3 outer segments more or less reflexed, larger than the 3 inner, erect ones. Stamens 3, distinct, placed before the 3 inner segments of the perianth. Stigmas 3, petaloid, concealing the stamens. Capsule 3—6-angled. Rhizoma creeping or tuberous.

1. *I. versicolor.**Blue-Flag.*

Stem stout and thick, acute on one side, simple or branching; leaves ensiform, sheathing at base; flowers beardless, large, blue, showy; outer segments of the perianth variegated with green, yellow, and white, and veined with purple; inner segments scarcely as long as the petaloid stigmas, which are reflexed and bifid at apex; ovary obtusely triangular, somewhat concave on the sides, but becoming nearly flat. A handsome plant, common in wet meadows. Stem 1—2 ft. high. *June.*

2. *I. Virginica.**Slender Blue Flag.*

Stem slender, round, sometimes branching; leaves long, narrow-linear; flowers large, blue, showy; segments of the perianth as in the last, only narrower and more veined with yellow; ovary acutely 3-angled, each side with 2 deep grooves. A more slender species than the last, distinguished by its round stem, narrow, grass-like leaves, and acutely angled ovary. It is chiefly found in meadows along the coast. Stem 1—2 ft. high. *June.*

3. *I. sambucina.**Flower-de-Luce.*

Stem often branching, many-flowered; leaves ensiform, involute at apex, shorter than the stem; spathe membranous at apex, flowers large, beardless, usually light blue or bluish-white; lower ones pedunculate; segments of the

perianth emarginate; stigmas acute, serrate. A beautiful species, common in gardens. Stem 1–3 ft. high. *May–June.*

4. *I. pumila.* *Dwarf Iris.*

Scape low, 1-flowered; leaves numerous, broad-ensiform, as long as the scape; flowers large, deep violet; outer segments of the perianth reflexed, narrower than the inner, erect ones. A small species, common in gardens, flowering earlier than others. *April–May.*

5. *I. ochroleuca.* *Yellow Iris.*

Stem tall, roundish; leaves ensiform, striate; flowers large, sulphur-yellow, beardless; ovaries 6-angled. A tall species, 2–4 ft. high, not uncommon in cultivation. *April–July.*

2. TIGRIDIA.

Perianth arising from a 2-leaved spathe, 6-parted, 3 outer segments larger than the 3 inner ones. Stamens 6. Filaments united in a long tube.

1. *T. pavonia.* *Tiger-flower.*

Stem erect, round, leafy, slightly branched; leaves erect, ensiform, veined; flowers very large, scentless, yellow, beautifully variegated with purple, crimson and scarlet, quickly fading; petals contracted in the middle and rounded at apex. A splendid bulb, frequently cultivated. Stem 2–3 ft. high. Flowers 4'–6' broad, opening and fading in the same day, in succession. *July–Sept.*

3. SISYRINCHIUM.

Perianth arising from a 2-parted spathe, 6-parted; segments similar, spreading. Stamens monadelphous. Stigmas 3, filiform. Capsule globose, somewhat 3-angled.

1. *S. Bermudianum.* *Blue-eyed Grass.*

Scape simple or branching, compressed, winged, naked or 1–2-leaved; leaves narrow-linear, grass-like; spathe with 2–5 blue flowers, opening in succession, and arranged in a kind of umbel; pedicels filiform; segments of the perianth obovate, mostly emarginate, mucronate. A delicate and pretty little plant in moist meadows and grassy fields. Scape 6'–12' high. It varies in the breadth of the scape, which is sometimes very slender, almost setaceous, with very narrow leaves. *June–July.*

4. CRŌCUS.

Perianth funnel-form with a very long, slender tube, arising from a radical spathe. Stigma 3-cleft, crested; segments convolute.

1. *C. vernalis.* *Crocus.*

Flowers large, with a very long, slender tube, sessile on the bulb; anthers sagittate, yellow; stigma included in the perianth, with short segments; scape triangular, rising after flowering, and bearing the ovary; leaves narrow-linear, following the flowers. A very showy little garden plant, generally the first to appear in the spring. The flowers are purple, yellow or white, opening in *March or April.*

ORDER CXXX. Smilacææ.—*Smilax-family.*

1. SMILAX.

Flowers dioecious or polygamous. Perianth campanulate, with 6 equal, spreading, deciduous segments. Stamens 6, attached at base, with short filaments. Anthers linear, attached by the base. Stigmas 3, nearly sessile. Berry globose, 1–3-celled, 1-seeded.

1. *S. rotundifolia.* *Greenbrier.*

Stem climbing, prickly, woody; branches round or somewhat 4-angled; leaves roundish-ovate, somewhat cordate at base, 5-nerved, abruptly acuminate, on short petioles, pale beneath; flowers small, yellowish-green, in little pedunculate, axillary umbels; berries round, bluish or yellowish-green, with a glaucous bloom. A very prickly vine, with yellowish-green stems, growing in thickets, climbing over the shrubs, and binding them together so as to make them almost impassable. *June.*

2. *S. herbacea.* *Carriion-flower.*

Stem herbaceous, unarmed, angular, erect, recurved or climbing by tendrils; leaves ovate, or ovate-oblong, often roundish, 7–9 veined, mucronate or acuminate, usually cordate at base, smooth, paler beneath; flowers yellowish-green, in dense umbels of 20–40, on long peduncles, extremely fetid; berries dark-

blue, covered with a bloom. A coarse, variable plant, common in moist thickets and low grounds, sufficiently distinguished by the disgusting and carrion-like odor of the flowers. Stem 8–8 ft. long. *June.*

ORDER CXXXI. Trilliaceæ.—*Trillium-family.*

1. TRILLIUM.

Sepals 3, green, persistent. Petals 3, colored, at length withering. Stamens 6. Anthers linear, with short filaments. Stigmas subulate, spreading or recurved, persistent. Berry 3-celled; cells several-seeded. Stem simple, 1-flowered, bearing a single whorl of 3 leaves.

1. *T. cernuum.* *Nodding Trillium.*

Leaves broad-rhomboidal, abruptly acuminate, nearly sessile; flower nodding beneath the leaves, on a recurved peduncle, white; petals oblong-ovate, acute, recurved, scarcely longer than the sepals. A common plant in wet woods, distinguished from the other species by its small, nodding flower. Stem 8'–15' high. *May–June.*

2. *T. erectum.* *Bath Flower.*

Leaves broad-rhomboidal, abruptly and sharply acuminate, sessile; peduncle nearly erect, soon reclining; petals ovate, flat, spreading, scarcely longer, but much broader than the sepals, dull purple; ovary brownish-purple. A showy species, but of very unpleasant odor. Common in low, rich woods. Stem 10'–15' high. *May.*

3. *T. erythrocarpum.* *Smiling Wake-robin.*

Leaves ovate, long-acuminate, rounded at base, petiolate; flower large, on a nearly erect peduncle; petals ovate-lanceolate or elliptic-lanceolate, acuminate, wavy at the edges, recurved, spreading, twice as long as the sepals, white, variegated with purple stripes at base. A very beautiful species, common in damp woods, Northern N. Eng. and N. York. Stem 8'–12' high. *May.*

2. MEDEOLA.

Perianth revolute, consisting of 6 petaloid, similar, oblong, deciduous segments. Stamens 6, with filiform filaments. Stigmas 3, long and recurved, divergent, filiform, deciduous. Berry globose, 3-celled, several-seeded.

1. *M. Virginica.* *Cucumber Root.*

Stem erect, slender, simple, covered with soft locks of wool; leaves in 2 whorls; lower one near the middle of the stem, consisting of 5–8 obovate-lanceolate, acuminate leaves; upper one of 3 ovate, acuminate, smaller leaves; flowers pedunculate, nodding from the upper whorl, 1–3, appearing in succession, yellowish-green; styles dark red. A very elegant plant, remarkable for its almost perfect symmetry. Stem 1–2 ft. high, from a tuberous, white, fleshy, horizontal rhizoma, which has the shape, appearance, and somewhat of the taste of a cucumber. Common in rich, damp woods. *June–July.*

ORDER CXXXII. Liliacææ.—*Lily-tribe.*

SYNOPSIS OF THE GENERA.

A. Flowers on a scape.

* Flower solitary.

1. TULIPA. Perianth erect, with 6 distinct segments. Capsule oblong.
4. ERYTHRONIUM. Perianth nodding; segments with a groove at base, and a tubercle each side. Capsule obovate.

** Flowers corymbose or umbellate.

7. ALLIUM. Flowers in a dense, subglobose umbel, arising from a spathe. Seeds ovate-reniform.

5. HEMEROCALLIS. Flowers large. Perianth funnel-form, with a short tube and spreading segments. Filaments long and filiform, declinate, style filiform, declinate. Stigma simple.

8. ORNITHOGALUM. Scape with a few, white, corymbose flowers at summit. Filaments dilated at base. Stigma 3-angled.

11. CLISTONIA. Flowers few, umbellate. Perianth campanulate. Stamens inserted at the base of the distinct sepals. Style filiform, columnar.

*** Flowers neither corymbose nor umbellate.

6. POLYANTHUS. Scape branching, scaly. Flowers large, alternate on the branches. Perianth funnel-form. Stamens inserted at the throat.

9. HYACINTHUS. Flowers in a simple raceme. Stamens inserted near the middle of the 6 segments of the perianth.

10. CONVALLARIA. Flowers in a simple, mostly 1-sided raceme. Stamens inserted at the base of the 6 segments of the perianth.

*B. Stem leafy.**** Peduncles 1-flowered, erect; or 1-5-flowered and nodding or recurved.**

2. *LILIUM*. Stem arising from a bulb. Flowers terminal, very large, with 6 distinct, spreading or recurved sepals, on erect or recurved peduncles.

16. *ASPARAGUS*. Stem arising from a bulb. Perianth 6-parted, erect, spreading above. Fruit a globular, 3-celled berry. Herbs with very branching stems and setaceous leaves.

8. *FRITILLARIA*. Stem arising from a bulb. Peduncles 1-flowered, axillary. Perianth large, campanulate. Fruit a 3-angled capsule.

13. *POLYGONATUM*. Rhizoma creeping. Peduncles axillary, 1-5-flowered. Perianth small, tubular. Fruit a globular berry.

14. *UVULARIA*. Peduncles terminating the branches. Anthers linear. Capsule 3-angled.

15. *STEEPTOPS*. Peduncles terminating the branches. Anthers sagittate.

**** Peduncles erect, many-flowered.**

7. *ALLIUM*. Flowers in dense, globose umbels.

12. *SMILACINA*. Flowers in simple or compound, corymbose racemes. Perianth deeply 4-6-parted, with spreading segments.

1. *TULIPA*.

Perianth campanulate; segments 6. Stamens 6, short, subulate. Anthers 4-angled. Stigmas thick. Capsule oblong, 3-angled.

1. *T. Gesneriana*.*Tulip.*

Scape smooth, 1-flowered; leaves radical, ovate-lanceolate; flowers erect; segments of the perianth obtuse, smooth. A very common and universally admired exotic bulb. The varieties in the color and form of the flowers are almost endless. They are yellow, red, purple, white, or variegated with several or all of these colors. *May-June*.

2. *LILIUM*.

Perianth campanulate or somewhat funnel-form; segments 6, distinct, each with a honey-bearing furrow near the base. Stamens 6. Anthers linear. Style longer than the stamens. Capsule oblong, somewhat 3-angled. Seeds flat.

1. *L. Canadense*.*Yellow Lily.*

Leaves in several remote whorls of 3-6, lanceolate, 3-nerved, rough on the margins and nerves; flowers nodding, campanulate, few, yellow, often tinged with scarlet, spotted with purple inside, on long peduncles; sepals sessile, revolute from the middle. A very handsome Lily, common in wet meadows. Stem 2-3 ft. high. *June-July*.

2. *L. Philadelphicum*.*Red Lily.*

Leaves linear-lanceolate, acute; lower ones usually scattered; upper ones verticillate in several whorls of 5-7; flowers 1-4, campanulate, erect, vermilion red, spotted inside; sepals lanceolate, erect, tapering to a claw at base. An elegant species, distinguished by its erect, red flowers. Common in dry thickets and shrubby pastures.

3. *L. candidum*.*White Lily.*

Stem erect, thick; leaves scattered, lanceolate, tapering at base; flowers large, campanulate, snow-white, in a terminal umbel, very fragrant, smooth inside. A common and favorite plant in gardens, often 3-4 ft. high. *July*.

4. *L. bulbiferum*.*Bulb-bearing Lily.*

Stem leafy, bulb-bearing; leaves scattered, 3-veined, narrowly lanceolate; flowers large, campanulate, nearly or quite erect, rough within, and of a deep orange. A showy garden species, with brownish bulbs in the axils of the leaves. Stem 3-5 ft. high. *July*.

5. *L. tigrinum*.*Tiger Lily.*

Stem tall, bulb-bearing; leaves scattered, 3-veined, lanceolate; upper ones ovate, cordate at base; flowers large, dark orange, spotted with brownish-purple, in a pyramidal raceme; segments of the perianth revolute, covered with glandular projections on the inside. A tall, showy species, common in gardens. Stem 5-6 ft. high, having brownish bulbs in the axils of the leaves. *July-Aug.*

3. *FRITILLARIA*.

Perianth campanulate; segments 6, broad at base, with a honey-bearing cavity just above the claw. Stamens 6, as long as the petals.

1. *F. imperialis*.*Crown-imperial.*

Stem thick, leafy below, naked above; leaves mostly linear-lanceolate, long and narrow, entire; flowers large, nodding, pedicellate, in a terminal cluster; pedicels each furnished with a pair of small, narrow leaves, which, together,

form a sort of terminal crown, beneath which the flowers hang. A very showy early-flowering plant, common in gardens. The flowers vary from red to yellow. Stem 2-3 ft. high. *April-May*.

4. *ERYTHRONIUM*.

Perianth campanulate; segments 6, distinct, recurved, deciduous, the 3 inner usually with a groove in the middle of the base, and a tubercle each side of it. Filaments 6, subulate. Style elongated. Capsule obovate, 3-valved. Seeds ovate.

1. *E. Americanum*.*Dog-tooth Violet.*

Nearly stemless; scape about 2-leaved near the base, 1-flowered; leaves oval-lanceolate or lanceolate, green, spotted with brownish-purple, nearly equal in length, but usually quite unequal in width; flower nodding, pale yellow, spotted at base inside; style clavate; stigma undivided. An elegant little spring-flower, common on rich hill-sides and in thickets, well distinguished by its brown spotted leaves. Scape 3'-6' high. *May*.

5. *HEMEROCALLIS*.

Perianth funnel-form; tube short; limb spreading, 6-parted. Stamens 6, inserted at the throat. Filaments declinate, long and filiform. Style long and filiform, declinate. Stigma simple. *Acaulescent*.

1. *H. fulva*.*Day Lily.*

Scape erect, smooth, corymbosely branching above; leaves long-linear, carinate, in large radical tufts; flowers large, erect, bracted, of a tawny red on the inside, in a sort of terminal corymb, expanding singly in succession; outer sepals with branching veins, inner wavy, obtuse. A very showy flower, common in gardens, from which it has sometimes strayed. Scape 2-4 ft. high. Leaves 10'-15' long. *July*.

2. *H. flava*.*Yellow Day Lily.*

Scape erect, branching above; leaves broad-linear, carinate, in radical tufts; flowers light-yellow, smaller than in the last, expanding singly in succession; segments of the perianth with undivided veins; inner ones flat, not wavy, acute. A smaller species than the last, not so frequent in cultivation, and distinguished by the much smaller yellow flowers. Scape 10'-15' high. *July*.

6. *POLYANTHES*.

Perianth funnel-form, incurved; segments 6; filaments inserted at the throat; ovary at the bottom of the tube.

1. *P. tuberosa*.*Tuberose.*

Acaulescent; scape scaly, branching above; leaves linear-lanceolate; flowers numerous, large, white, fragrant; petals oblong. A splendid plant, common in house cultivation. Scape 2-3 ft. high, arising from a bulb which is furnished with tuberous rootlets. *Aug.-Sep.*

7. *ALLIUM*.

Flowers in an umbel, with a 1-2-leaved spathe at base. Perianth of 6 sepals, which are distinct, or united at base, 1-nerved, mostly persistent. Stamens 6. Style filiform. Stigma acute, simple. Capsule 3-lobed, 3-valved. Seeds black, ovate-reniform.

1. *A. Canadense*.*Wild Garlic.*

Scape round, leafy at base; leaves narrow-linear, smooth, nearly flat; umbel consisting mostly of dense, sessile little bulbs, among which are scattered small, white, or pale rose-colored flowers, on slender pedicels; bulbs bracted at base. Common in wet meadows. Scape 10'-15' high. *June*.

2. *A. vineale*.*Crow Garlic.*

Stem slender, with a few leaves below; leaves round, hollow, and channelled above; umbel often bearing sessile bulbs, as in the last; flowers pedicellate, numerous, rose-color and green; stamens exsert, alternate; filaments 3-cleft, the middle segment bearing the anther. A foreign species, naturalized abundantly near the coast in some districts. Scape 1-2 ft. high. *June-July*.

3. *A. tricoccum*.*Wild Leek.*

Scape naked; leaves oval-lanceolate or oblong-lanceolate, flat, thin, smooth, tapering to a petiole, withering before the appearance of the flowers; umbel not bulb-bearing, many-flowered, globose; flowers white; filaments undivided; pod deeply 3-lobed. A strong-scented species, common in damp, rich woods, and distinguished, when not in flower, by its broad-lanceolate leaves, and when in blossom by the globose, many-flowered umbels. Scape 8'-15' high. *June-July*.

4. *A. Cēpa*.*Onion.*

Scape stout, hollow, swelling below the middle, glaucous; leaves round, hollow, swelling below the middle, glaucous, shorter than the scape; umbel globose, many-flowered; flowers greenish-white. Universally cultivated for its bulb, whose value as an esculent vegetable is well known. Scape 3—4 ft. high, appearing the second year from the seed. *July*.

5. *A. sativum*.*Garlic.*

Bulb compound, consisting of several smaller ones united, and included in one covering membrane; stem leafy, bulbiferous; leaves linear; flowers small, white; stamens 3-cleft. A species sometimes cultivated for its acrid and strongly-flavored bulbs, which are used as a seasoning. Scape 2 ft. high. *July*.

6. *A. pōrrum*.*Leek.*

Stem compressed, leafy; leaves long, alternate, linear, sheathing at base; umbel large, many-flowered; flowers small, white; stamens 3-cleft. Often cultivated. The root is a cylindrical, scaly bulb. Stem 2 ft. high. *July*.

7. *A. schænoprāsūm*.*Cive.*

Scape leafy only at base; leaves round-angulate, in dense tufts, equalling the scape; umbels densely flowered; flowers purplish. A small species, often cultivated, and distinguished by its very slender leaves and scapes. *June*.

8. ORNITHOGALUM.

Perianth leafy, 6-parted; segments spreading above the middle. Filaments 6, dilated at base. Stigma 3-angled. Capsule roundish, angled. Seeds roundish.

1. *O. umbellātum*.*Star of Bethlehem.*

Scape naked; leaves narrow-linear, channelled, as long as the scape; flowers few, loosely corymbose, pedicellate, bracted; sepals white, marked with a green stripe on the outside. A low and rather pretty plant, often cultivated, and sometimes naturalized in meadows along the coast. Scape 5'—8' high. *May*.

9. HYACINTHUS.

Perianth varying from funnel-form to campanulate, subglobose; segments 6, similar. Stamens 6, inserted near the middle of the segments. Ovary with 3 honey-bearing pores at summit. Cells of the capsule 1—3-seeded.

1. *H. orientālis*.*Hyacinth.*

Scape naked; leaves linear-lanceolate, half as long as the scape; flowers in a dense, terminal and somewhat thyrsoid raceme; perianth funnel-form, cleft to the middle, swelling at base. A splendid bulb, long cultivated and admired. Scape 6'—12' high. Flowers usually purple, varying to pink, white, blue, and all very fragrant. *April—May*.

10. CONVALLARIA.

Flowers racemed. Perianth campanulate, 6-parted; segments spreading, united at base. Stamens 6, at the base of the segments. Berry globose, 2-celled.

1. *C. majālis*.*Lily of the Valley.*

Scape smooth, naked, semi-cylindric; leaves usually 2, situated near the base of the scape, ovate or elliptic-ovate; flowers white, fragrant, in a simple, loose, 1-sided raceme. A delicate, sweet-scented little plant, native of the South, and often cultivated in gardens. Scape 5'—6' high. *May*.

11. CLINTONIA.

Flowers umbellate. Perianth campanulate. Sepals 6, distinct, deciduous. Stamens 6, inserted at the base. Style long, filiform, columnar. Stigma semicircular, depressed. Ovary 2-celled. Berry ovoid, several-seeded.

1. *C. boreālis*.*Wild Lily of the Valley.*

Rhizoma slender, creeping; scape naked, 2—4-leaved at base; leaves large, oval or oblong, petiolate, smooth and shining, ciliate with scattered hairs; flowers few, rarely single, greenish-yellow, nodding, in a terminal umbel; perianth somewhat pubescent outside; berries blue. An elegant liliaceous plant, common in damp woods, especially in northern districts. Scape 5'—12' high; leaves 8' long. *June*.

12. SMILACINA.

Perianth 4—6-parted, spreading, deciduous. Stamens 4—6, inserted at the base of the segments. Ovaries 2—3-celled. Berry globular, few-seeded. *Rhizoma creeping*,

1. *S. bifolia*.*Two-leaved Solomon's Seal.*

Nearly or quite smooth; stem mostly 2-leaved; leaves cordate, petiolate, or sessile; flowers very small, white, in a dense raceme; perianth 4-parted; stamens 4; berry 2-celled, reddish, spotted. A delicate little plant, common in moist woods. Stem 4'—8' high. *May*.

2. *S. racemōsa*.*False Spikenard.*

Minutely pubescent; stem leafy, flexuous, recurved at top; leaves oval or oval-lanceolate, long-acuminate, ciliate, strongly veined, abruptly tapering to a short petiole; flowers very small, white, in a large, compound paniculate raceme; parts of the flower in sixes; ovary 3-celled; berry pale red, spotted with purple. A common species in moist woods and thickets. Stem 1—2 ft. high. *June*.

3. *S. stellāta*.*Star-flowered Solomon's Seal.*

Smooth; stem erect, leafy; leaves oblong-lanceolate, acute, glaucous beneath, somewhat clasping; flowers white, larger than in the last, in a simple raceme; parts of the flower in sixes; ovary 2-celled; berries very dark purple. A smaller species, with larger flowers than the last, found on river-banks, and most common in the northern districts. Stem 8'—15' high. *May—June*.

13. POLYGONATUM.

Perianth tubular, 6-cleft at summit. Stamens 6, inserted at or above the middle of the tube, and inclosed in it. Ovary 3-celled. Berry globular. Cells 1-seeded.

1. *P. pubescens*.*Solomon's Seal.*

Stem recurved at summit, round, rarely marked with a single furrow; leaves oval-lanceolate or oblong-ovate, glaucous and very slightly pubescent beneath, 3—5-veined, sessile; peduncles axillary, smooth, nodding, 1—2-flowered; flowers greenish; filaments inserted near the summit of the perianth; berry dark blue, often nearly black. A common plant of elegant growth, found in woods and thickets. Stem 1—2 ft. high. *June*.

2. *P. canaliculātum*.*Large Solomon's Seal.*

Stem tall and stout, angular or channelled, recurved; leaves oblong-ovate, somewhat clasping at base, smooth and green on both sides, marked with numerous prominent veins; peduncles nodding, smooth, 2—5-flowered; flowers greenish; filaments inserted at the middle of the perianth-tube; berries as in the last. A much stouter plant than the last, 2—5 ft. high, growing in rich, moist thickets, and along rivers. It is occasionally found in N. Eng., but is most common in the Middle States. *June*.

14. UVULARIA.

Perianth nearly campanulate, deeply 6-parted; segments with a honey-bearing groove at base. Stamens 6, short, adherent to the base of the segments. Anthers comparatively long. Style deeply 3-cleft. Capsule 3-angled, 3-celled, opening by 3 valves at top. Seeds few in a cell, arilled. *Rhizoma creeping*.

1. *U. grandiflōra*.*Large Bellwort.*

Stems branching above, recurved; leaves perfoliate, oblong or oval-ovate, paler beneath; flowers large, greenish-yellow lily-like, nodding, terminating the branches; sepals smooth within; anthers somewhat obtuse. A very graceful plant, with greenish-yellow, flowers, common in rich woods, especially in the Northern districts. Stem 8'—18' high. *May—June*.

2. *U. perfoliāta*.*Perfoliate Bellwort.*

Stem recurved, branching above; leaves perfoliate, oval-lanceolate or oblong-lanceolate, glaucous beneath; flowers greenish-yellow, solitary, nodding, on one of the usually two branches of the stem; sepals rough inside; anthers acute. An elegant species smaller than the last, common in moist thickets and rich woods. The stem divides into 2 branches, one bearing the leaves, the other leaves and the flower. Plant 6'—16'. *May*.

3. *U. sessiliflōia*.*Sessile-leaved Bellwort.*

Smooth; stem recurved and branching above; leaves sessile, not perfoliate, oval or oval-lanceolate, pale green, glaucous beneath; flower solitary, yellowish-white, terminating as in the last, one branch of the stem while the other is occupied by leaves; sepals smooth within; anthers acute. A delicate little plant, common in low woods. Stem 5'—12' high. *May*.

15. STREPTOPUS.

Perianth campanulate, 6-parted; segments recurved, spreading, each with a honey-bearing furrow at base; 3 inner ones

cuneate. Anthers sagittate, longer than the very short filaments. Berry roundish, 3-celled. Cells few-seeded.

1. *S. roseus.**Twistfoot.*

Stem smooth, somewhat stout, dichotomously branching; leaves ovate, long-acuminate, rounded and clasping at base, ciliate on the margin, smooth and green on both sides; peduncles opposite the leaves, but bent and contorted so as to appear axillary, filiform, pendent; flowers small, rose-color, spotted, more than half as long as the short peduncle; stigma obscurely 3-parted. An elegant plant, 10'—15' high, common in dense, evergreen woods, especially in Northern districts and on mountains. *May—June.*

16. ASPÁRAGUS.

Perianth erect, 6-parted; segments spreading above, with the 6 stamens at base. Style short. Stigma 3-lobed. Berry globular, 3-celled. Cells 2-seeded.

1. *A. officinális.**Asparagus.*

Stem erect, very branching, herbaceous; leaves setaceous, in clusters, pale green; flowers small, axillary, solitary or 2 together, yellowish-green; berries red. A plant generally cultivated for its young shoots. It is to some extent naturalized along the sea-coast. Stem 2—4 ft. high. *June.*

ORDER CXXXIII. Pontederiaceæ.—*Pickereel-weed-family.*

1. PONTEDÉRIA.

Perianth funnel-form, bilabiate, upper lip 3-parted; lower lip of 3 spreading divisions, forming the curving tube of the perianth, and separating more or less nearly down to the base; lower part persistent, inclosing the fruit. Stamens 6, 3 inserted near the summit of the tube, and exsert; 3 near the base (often imperfect) with very short filaments. Ovary 3-celled, 1-ovuled. *Per.*

1. *P. cordata.**Pickereel-weed.*

Stem thick and stout, erect, 1-leaved; leaves mostly radical, cordate-sagittate, smooth and glossy-green, petiolate; flowers blue, in a dense, terminal spike, furnished with a bract-like spathe; tube of the perianth marked with toothed ridges; anthers blue. A showy aquatic, common in shallow water and muddy borders of ponds, arising from a creeping rhizoma. Scape 10'—18' above water. It varies with scarcely cordate leaves. *July.*

ORDER CXXXIV. Melanthaceæ.—*Colchicum-family.*

1. VERATRUM.

Flowers polygamous; segments of the perianth 6, distinct, spreading, without glands at base. Stamens 6, shorter than the perianth, and inserted at the base of its segments. Ovaries 3, united at base, often abortive. Capsule 3-lobed, separating into 3 carpels.

1. *V. víride.**White Hellebore.*

Stem simple, stout, tall, very leafy, pubescent; leaves broad-oval, acuminate, strongly veined and plaited, sheathing at base; flowers dull-yellowish-green, very numerous, in long, bracted racemes, forming a very large, pyramidal, terminal panicle. A coarse and rank-looking herb, common in low meadows and swamps. Stem 2—4 ft. high; leaves 4'—6' long. The root is extremely poisonous, and is sometimes used in medicine. *June.*

ORDER CXXXV. Juncaceæ.—*Rush-family.*

1. LŪZULA.

Perianth persistent. Stamens 6. Stigmas 3. Capsule 1-celled, 3-seeded. *Leaves grass-like.*

1. *L. pilosa.**Wood Rush.*

Leaves linear-lanceolate, hairy with long, whitish hairs; flowers usually

solitary, pedunculate, in a long, leafy umbel; sepals acuminate; capsules obtuse. A little grass-like plant, with hairy leaves, not uncommon in open woods and groves. Stem 4'—8' high. *May.*

2. *L. campestris.**Field Rush.*

Leaves linear, hairy, especially on the margin; flowers in little spikes, arranged in a sort of umbel on peduncles of different lengths, the central one being nearly sessile, all light brown or yellowish; sepals acuminate, awned, longer than the obtuse capsule. A still more common species than the last, clearly distinguished by its flowers, sessile in little spikelets, and not on solitary peduncles. Plant 3'—10' high, growing in fields and open woods. *May.*

2. JŪNCUS.

Perianth persistent, 6-parted. Stamens 6, rarely 3. Stigmas 3. Capsule 3-celled, loculicidal, many-seeded.

* *Leafless. Flowers lateral.*

1. *J. effusus.**Bullrush.*

Scape erect, soft and flexible, striate, sheathed at base; flowers in a sessile, very branching panicle, proceeding from a fissure in the side of the scape above the middle, small, numerous, greenish; sepals acute; stamens mostly 3; capsule obtuse. A common Rush, growing in tufts in wet grounds. Scape slender, 2—3 ft. high. *June—July.*

** *Leaves nearly round, knotted, both cauline and radical. Flowers terminal.*

2. *J. paradóxus.**Appendaged Rush.*

Stem somewhat stout, round; leaves nearly or quite round; flowers in greenish, many-flowered, globose heads, forming a decompound panicle; sepals lanceolate, tapering to a slightly subulate point. A common species in wet grounds, distinguished by its decompound panicle and globular, many-flowered heads. Stem 2 ft. high. *July—Aug.*

3. *J. acuminátus.**Bog Rush.*

Stem erect, round; leaves few, round or nearly so; flowers in many or few brownish, few-flowered heads, arranged in a panicle with somewhat spreading branches; sepals linear-lanceolate or lanceolate, very acute, much shorter than the acute, triangular capsule. A common species in bogs and along ponds. Stem 10'—18' high, slender. *Aug.*

*** *Leaves flat or channelled, or somewhat involute. Flowers terminal.*

4. *J. tenuis.**Slender Rush.*

Stem very slender, erect, leafless, except at base; leaves linear, setaceous, shorter than the stem; bracts of the involucre 2—3, recurved, much longer than the cymose panicles; flowers separate, rarely sessile, in a loose, somewhat umbelled, cymose panicle, with unequal branches; sepals lanceolate, acuminate, longer than the ovoid-globose capsule. A common and very slender Rush, along paths and in fields, distinguished by its narrow leaves and separate flowers.

5. *J. Gerárdi.**Black Grass.*

Stem simple, compressed, leafy, rigidly erect, or procumbent; leaves mostly radical, very narrowly-linear, shorter than the stem; flowers in a small, few-flowered, crowded panicle; bracts of the involucre shorter than the panicle; sepals oblong-ovate, obtuse, about as long as the obtuse capsule. A common species in salt marshes, where it is distinguished by its dark green foliage and dark brown fruit. Stem 6'—12' high. *July.*

6. *J. bufónius.**Annual Rush.*

Stem slender, leafy, often branching at base; leaves channelled, very narrowly linear; flowers greenish, remote, sessile, forming a spreading dichotomously branching panicle; sepals lanceolate, subulate at the point, much longer than the obtuse capsule. A little, annual species, growing in tufts, and distinguished by its branching stem and dichotomous panicle. Stems 3'—6' high. Common along road-slides. *June—Aug.*

7. *J. marginátus.**Broad-leaved Rush.*

Stem erect, compressed, leafy; leaves linear, thick, somewhat grass-like; flowers clustered in little, few-flowered heads, and forming a cymose panicle, which is simple or compound; sepals oblong, as long as the globular capsule, light brown; stamens 3. A common species in Southern N. Eng. and N. York, in low grounds, distinguished by its comparatively broad, grass-like leaves, and nearly flat and somewhat dense, cymose panicles. Stem 1—3 ft. high. *July.*

ORDER CXXXVI. Commelynaceæ.—*Spiderwort-family*.

1. TRADESCANTIA.

Flowers regular. Sepals persistent. Petals all similar, sessile. Stamens perfect, with bearded filaments. Anthers reniform. Capsule 2—3-celled.

1. T. Virginica.

Spiderwort.

Stem nearly or quite erect, simple or branching, jointed, leafy; leaves linear-lanceolate, crenate, sheathing at base, tapering to an acute point, at length elongated and reflexed. A handsome plant, with bright blue flowers, native in Western N. York and farther West, but frequent in cultivation. Stem erect, 1—2 ft. high, mucilaginous. *May—Aug.* *Per.*

ORDER CXXXVII. Xyridaceæ.—*Yellow-eyed Grass-family*.

1. XÏRIS.

Flowers in dense, terminal heads, each inclosed in a scale-like bract. Sepals 3; 2 lateral ones persistent, the larger one inclosing the yet-unopened corolla, and finally deciduous with it. Petals with more or less united claws. Stamens 3, on the claws of the petals, alternating with 3 sterile ones. Style 3-cleft. Capsule 1-celled, with 3 parietal placenta.

1. X. bulbosa.

Yellow-eyed Grass.

Scape slender, more or less bulbous at base, somewhat 8-angled, compressed above, very smooth, at length twisted; leaves much shorter than the scape, narrow-linear; flowers in an ovoid-globose head; stamens projecting from the yellow, ovate, erenate, spreading petals. A curious, rush-like plant, 4'—10' high. Rather common, especially in marshy grounds near the coast. *July—Sept.*

ORDER CXXXVIII. Eriocaulonaceæ.—*Pipe-wort-family*.

1. ERIOCAULON.

Flowers monœcious, collected in a dense head; central ones sterile, with 4—6 stamens; outer ones fertile, with 1 style and a 2—3-parted stigma. Perianth double, persistent. Sepals 2—3. Corolla in the sterile flowers tubular; in the fertile flowers consisting of 2—3 separate segments. Capsule 2—3-celled, Cells 1-seeded.

1. E. septangulare.

Pipewort.

Smooth; aquatic; scape smooth, about 7-furrowed; leaves radical, linear, subulate at extremity, pellucid, in tufts at the bottom of the water; flowers white, in dense, hemispherical heads; outer scales or bracts obovate, obtuse. An aquatic of very simple cellular structure, common in the edges of ponds, with a slender, erect scape, arising from a tuft of leaves at bottom, and bearing the white, dense head of flowers at the top. The length of the scape varies with the depth of the water, from a few inches to several feet in length. *July—Aug.*

ORDER CXXXIX. Cyperaceæ.—*Sedge-family*.

SYNOPSIS OF THE GENERA.

A. Flowers all perfect.

* Flowers arranged in the spikelets in 2 rows.

1. CYPÉRUS. Spikelets in loose or dense clusters, usually arranged in an irregular, simple or compound involucre umbel, rarely a globose head.

2. DULICHNUM. Spikelets in loose, solitary, axillary spikes.

** Flowers not arranged in very regular rows in the spikes or spikelets.

3. ELEOCHARIS. Spike single, terminal. Perianth consisting of about 6 bristles. Stamens 3. Style bulbous at base. Achenium tuberculate.

4. SCIARPS. Spikes single or clustered, and either lateral or terminal. Perianth consisting of 8—6 bristles surrounding the ovary, and scarcely if at all exceeding the glume. Stamens 3. Styles not bulbous at base.

5. ERIOPHORUM. Spikes in irregular umbels, rarely solitary. Perianth consisting of many, rarely of only 6 long, woolly bristles, much exceeding the glumes.

6. FIMBRISTYLIS. Spikes in irregular, involucre umbels. Perianth of bristles none. Stamens 3. Style 2—3-cleft, not bulbous at base.

B. Flowers monœcious, dioecious or polygamous.

7. RHYNCHOSPORA. Lower flowers of the spike pistillate, uppermost staminate; intermediate perfect. Perianth consisting of 6 bristles. Achenium with a short broad tubercle.

8. CLADIUM. Lower flowers of the spike empty; 1 or 2 of the rest usually staminate and barren, the terminal 1 perfect and fertile. Perianth of bristles none. Achenium without a tubercle.

9. CAREX. Flowers monœcious or rarely dioecious, the 2 kinds either in separate spikes, or in separate parts of the same spike; glumes 1-flowered. Fruit consisting of an inflated bag or sac, containing the achenium.

1. CYPÉRUS.

Spikelets few, many-flowered, in loose or dense, somewhat capitate clusters, which usually form an irregular, simple or compound umbel. Glumes arranged in 2 rows, decurrent at base. Stamens 1—3, usually 3. Style 2—3-cleft. Achenium lenticular or triangular. Culm triangular, with 1—3 leaves at summit, forming an involucre to the umbel.

* Style 2-cleft.

1. C. diándrus.

Brown Sedge.

Culm slender, usually decumbent; spikelets flat, oblong-lanceolate, acutish, 14—20-flowered, more or less in fascicles forming an umbel with 2—4 very short, sometimes unequal rays; glumes oblong, obtusish, brown on the margin; stamens 2. A little Sedge, distinguished by its reclining culm and brownish, broad spikelets. It varies with glumes of a chestnut color, and also with 3 stamens. Stem 6'—10' long. Leaves narrow-linear. *Aug.—Sep.*

2. C. Nuttállii.

Nuttall's Sedge.

Culms tufted, mostly erect; leaves narrow-linear; spikelets linear-lanceolate, acute, flat, many-flowered, in crowded clusters, arranged in an umbel, with a few mostly very short and nearly sessile rays; glumes oblong-lanceolate, acute, brownish. Stamens 2. A common, salt marsh species, especially distinguished from the last by its narrower spikelets and leaves. Culm 4'—10' high. *Aug*

** Style 3-cleft. Achenia triangular.

3. C. strigòsus.

Bulbous Sedge.

Culm erect, leafy, tuberos at base; leaves broad-linear; umbel simple or decomposed; spikelets narrow-linear, flat and few-flowered, at length reflexed, very numerous, in loose pedicellate clusters, on spikes forming an umbel, with many long and unequal rays, which are sometimes branched; scales oblong-lanceolate, yellowish; stamens 3; achenium narrow-oblong. A very common species in wet grounds, 1—2 ft. high, distinguished by its numerous, narrow, yellowish spikelets. *Aug.*

4. C. dentátus.

Toothed Sedge.

Slender, erect, leafy at base; leaves carinate, shorter than the stem; umbel composed of 4—6 branching rays; spikelets ovate-lanceolate, flat, usually 6—10-flowered, in pedunculate clusters of 3—5, forming a partial umbel on each ray; glumes very acute, brownish on the margin, green on the back; stamens 3; achenium minute. A rather common species in wet, sandy soils, distinguished by its completely compound umbel. Culm 8'—12' high. *Aug.*

5. C. filicúlmis.

Slender Sedge.

Culm very slender, wiry, tuberos at base, mostly erect; leaves mostly radical, very narrow-linear; spikelets linear-lanceolate, with a somewhat convex surface, 5—8-flowered, collected in a dense, globular, sessile head, which is either solitary or furnished with 1—2 smaller ones, on rather long, horizontal rays; glumes ovate, loose, greenish; stamens 3. A common species, 6'—12' high, growing in dry soils, and distinguished by its globular heads of spikelets, narrow leaves, and stem bulbous at base. *Aug.*

6. C. inflexus.

Dwarf Sedge.

Culms low, very slender, tufted, leafy at base; spikelets narrow-oblong, 8—10-flowered, collected in a few dense, ovoid heads, which are either sessile, aggregated, or on short peduncles; involucre of 3 very long leaves; glumes yellowish, oblong, tapering to a long, hooked point; stamen 1. A slender species, 2'—4' high, rather common in the sandy borders of ponds, distinguished by its few, dense heads of spikelets, and its single stamen. *Aug.—Sep.*

2. DULICHNUM.

Spikelets linear, compressed, arranged in 2 rows, on solitary,

axillary peduncles. Glumes arranged in 2 rows. Perianth reduced to bristles surrounding the ovary. Stamens 3. Style 2-cleft above, the lower portion persistent, forming a beak to the compressed achenium.

1. *D. spathaceum*.

Sheathed Sedge.

Culm erect, simple, leafy through the whole length, sheathed below; leaves alternate, linear, flat, short, arranged on the stem in 3 rows; spikes axillary and terminal, proceeding from the sheaths, consisting of 8–12 linear-lanceolate spikelets, loosely arranged in 2 rows; spikelets 5–9 flowered, rather long. A common plant along rivers and borders of ponds, 1–2 ft. high. *Aug.*

3. *ELEOCHARIS*.

Spikes single, terminal. Glumes imbricated all round without much order. Perianth reduced to 3–12, mostly 6, rigid, persistent bristles, surrounding the ovary. Stamens 3. Style 2–3-cleft, bulbous and persistent at base, forming a tubercle crowning the achenium. Culms leafless, simple.

* *Culms roundish, soft.*

1. *E. obtusa*.

Spike-rush.

Culms nearly terete in tufts; spike more or less globose, at length becoming somewhat cylindrical, obtuse, densely many-flowered; glumes very obtuse, light-brown, whitish on the margin; achenium obovate, of a shining brown, surrounded by 6 bristles twice as long as itself, and crowned with a very broad and flat tubercle. A common species in shallow water and muddy grounds. Culms 6'–12' high. *July–Aug.*

2. *E. palustris*.

Round Rush.

Culm nearly terete; spike oblong-lanceolate, acute, many-flowered, often obliquely attached; glumes reddish-brown, whitish on the broad margin; lower ones sometimes empty; achenium obovate, surrounded by about 4 bristles longer than itself, and crowned with a small, ovate, flattened tubercle. A quite variable species; very common in shallow water and low grounds. Culms 6'–20' high. *June–July.*

** *Culms angular or compressed.*

3. *E. tenuis*.

Slender Rush.

Culm very slender and wiry, 4-angled, with concave sides; spike elliptical, somewhat acute at each end, 20–30 flowered; glumes ovate, obtuse; achenium obovate, with a small, depressed tubercle, and surrounded by 2–4 bristles, or more. A common and very slender species in wet meadows, sufficiently distinguished by its size, and the 4-angled culm; 6'–12' high. *June–July.*

4. *E. acicularis*.

Hair Rush.

Culm setaceous, 4-angled; spike oblong-ovate, 8–3-flowered; glumes oblong-ovate, obtusish, purplish on the margin; achenium obovoid-triangular, crowned with a conical tubercle. A very delicate species, common in muddy grounds and edges of ponds, where the culms are as fine as hairs, and 2'–6' high. *June–July.*

4. *SCIRPUS*.

Spikes cylindrical, clustered, and furnished with an involucre, sometimes single, terminal or lateral. Glumes imbricated all round in no fixed order. Perianth reduced to 3–6 bristles. Stamens 3. Style 2–3-cleft, not bulbous at base, deciduous. Achenium lenticular or triangular. Culms sheathed at base.

* *Spikes lateral.*

† *Leafless.*

1. *S. debilis*.

Slender Club-rush.

Culms slender, furrowed, tufted, roundish, rarely with a single leaf at base; spikes few, generally about 3–4, ovoid, sessile, in a single cluster situated near the top of the culm, the prolongation of which serves for an involucre; glumes roundish-ovate, obtuse, pale yellowish-green; style 2–3-cleft; achenium obovate, shorter than the 4–5 bristles. A slender Rush of a pale-green color, common in wet grounds. Culm 6'–12' high. *Aug.*

2. *S. lacustris*.

Bulrush.

Culm tall, cylindric, filled with spongy pith, tapering above, and ending in an abrupt point, dark-green; spikes oblong-ovate, numerous, arranged in a compound panicle somewhat like an umbel, of a reddish-brown color; glumes ovate, mucronate; achenium obovate, mucronate, surrounded by 4–5 bristles. A tall, dark-green Rush. Common in wet grounds, usually leafless, sometimes with a single, subulate leaf. Culm 4–8 ft. high. *July.*

†† *Culm with leaves.*

3. *S. pungens*.

Acute Club-rush.

Culm acutely angled with concave sides; leaves few, carinate below, channelled above, often 6'–8' long; spikes ovoid, sessile, 1–5 in a cluster, which is much shorter than the involucreal prolongation of the stem; glumes ovate, 2-cleft, mucronate; style 2-cleft; bristles 2–6, shorter than the obovate, mucronate achenium. A common Rush growing in swamps, salt and fresh, and in the borders of ponds and streams, distinguished by the sharply triangular stem, and rather long, channelled leaves. *July–Aug.*

** *Spikes terminal. Culms leafy.*

4. *S. maritimus*

Sea Club-rush.

Culm acutely triangular, stout; leaves flat, linear, rough on the margin, as tall as the culm; involucre of 1–4 very unequal leaves; spikes ovate or oblong, several in a sessile cluster, often with 1 or more on peduncles of unequal length; glumes ovate, 3-cleft; achenium very broadly orbicular, flat on one side and convex on the other, longer than the 1–6 bristles surrounding it, which sometimes disappear. A stout Rush of the salt marshes, growing 1–3 ft. high. The spikes are of a rusty-brown color, and vary much in size. In the stoutest plants they are cylindrical, and an inch or more long. *Aug.*

5. *S. atróvirens*.

Umbelled Club-rush.

Culm obtusely triangular, rigidly erect, leafy; leaves broad-linear rough on the margin, flat; involucre of about 3 long leaves; spike ovoid, crowded in dense, globular, dark, dull-green heads, containing 10–20 spikes; these are arranged in a decomposed, and mostly branching umbel of unequal divisions; achenium obovate, compressed, scarcely shorter than the bristles. A common, leafy species, distinguished by the globose heads of spikelets arranged in the decomposed umbel. Culm 2–4 ft. high. *July.*

*** *Bristles capillary, twisting, much longer than the achenium, at length projecting from the rusty-brown scales.*

6. *S. lineatus*.

Bog-Rush.

Culm triangular, very leafy; leaves linear, flat, rough on the margin; spikes oblong, at length cylindrical, solitary, nodding, on filiform pedicels, arranged in terminal and axillary, paniculately-branching panicles; upper panicle with an involucre much shorter than itself; bristles 6, scarcely longer than the acute scales. A coarse, grassy species, common in wet meadows, 2–3 ft. high. *July.*

7. *S. Eriophorum*.

Wool-grass.

Culm obscurely 3-angled, very leafy; leaves narrow-linear, long, rough on the margin; leaves of the involucre longer than the decomposed, paniculate umbel, which is composed of ovate, clustered or pedicellate spikes; bristles 6, at length much longer than the obtuse scales, rust-colored. A coarse species like the last, but distinguished at sight by its erect panicle or umbel. It varies in the length of the branches of the umbel, and in some other respects. Culm 2–5 ft. high. *July–Aug.*

5. *ERIOPHORUM*.

Spikes many-flowered. Scales imbricated all round without order. Perianth consisting of numerous, rarely 6, woolly, persistent bristles, much longer than the glumes. Stamens mostly 3. Style 3-cleft.

1. *E. polystachyon*.

Cotton Grass.

Culm rigidly erect, obscurely 3-angled; leaves linear, flat, terminating in a triangular point; involucre 2–3-leaved; spikes about 10, on slender, nodding, rough or smooth peduncles. Wool straight, nearly an inch long. A very conspicuous and common inhabitant of bogs and meadows. Culm 1–2 ft. high. *June.*

2. *E. gracilis*.

Slender Cotton Grass.

Culm slender, leafy, somewhat 3-angled, rough on the angles, with concave sides; involucre short, usually 1-leaved; spikes 2–7, small, nodding, on short, roughish peduncles; wool white, much longer than the flower. A not uncommon species in bogs and swamps, distinguished from the last by its narrow, triangular leaves. Culm 1–2 ft. high. *July–Aug.*

3. *E. Virginicum*.

Brown Cotton Grass.

Culm rather stout, rigid, nearly terete, leafy; leaves long, flat, narrowly-linear, rough on the margin; involucre 2–4-leaved; spikes nearly sessile, erect, crowded in a dense head; wool dense, of a rusty-brown color, 3 or 4 times as long as the scale; stamen 1. A common species, sufficiently distinguished by the short, reddish wool. Culm 2–3 ft. high. *July–Aug.*

6. FIMBRISTYLIS.

Spike several or many-flowered. Glumes imbricated in regular rows. Perianth of bristles none. Stamens 1—3. Style 2—3-cleft, with a bulbous base, which is deciduous or persistent.

1. *F. autumnalis.**Autumn Club-rush.*

Culms low, slender, compressed, tufted; leaves narrow-linear, flat, acute, shorter than the stem; involucre 2-leaved; spikes oblong, acute, solitary, or in little clusters, forming a decompound umbel of unequal rays; glumes ovate-lanceolate, brownish, mucronate; stamens 2—3; style 3-cleft, entirely deciduous. A low grassy little plant, common in muddy grounds. Culms 3'—8' high. Aug.—Oct.

2. *F. capillaris.**Annual Club-rush.*

Culms nearly naked, capillary in dense little tufts; leaves setaceous, shorter than the culms, with sheaths, hairy at the throat; involucre 2—3-leaved; spikes ovoid, pedunculate, in a more or less compound, paniculate umbel; glumes oblong, brownish; stamens 2; style 3-cleft, the bulbous base persistent. A very delicate species, sufficiently distinguished by its setaceous leaves and culms, which are 3'—6' high. Common in sandy fields. Aug. An.

7. RHYNCÓSPORA.

Flowers in ovate, several-flowered, loose spikes. Lower glumes usually empty; upper ones often with imperfect flowers. Perianth of 6 bristles. Stamens usually 3. Style 2-cleft. Achenia lenticular, or somewhat globose, coherent with the bulbous, persistent base of the style.

1. *R. álba.**White Beak-rush.*

Culm slender, 3-angled above, leafy; leaves linear, very narrow, almost setaceous, channelled; spikes lanceolate, white, in corymbose, axillary and terminal fascicles, on slender peduncles; glumes lanceolate; achenium ovoid, shorter than the bristles, with a slender beak or tubercle nearly as long as itself. A very slender and graceful grassy plant, distinguishable by the white glumes of its spikes. Culm 10'—18' high. July—Aug.

2. *R. glomerata.**Beak Rush.*

Stem slender, triangular, leafy; leaves linear, flat, rough on the edge; spikes oblong-ovate, in dense, very distant, axillary and terminal clusters, on long peduncles, sometimes in pairs from the same axil; achenium obovoid, as long as the tubercle; bristles rough backwards, equalling the tubercle. A common species, distinguished from the last by the deep brown spikelets and remote clusters. Common in wet grounds. Culm 10'—20' high. July—Aug.

8. CLADIUM.

Flowers polygamous, in a loose, oblong or ovate spike; lower glumes empty; terminal ones bearing a perfect or fertile flower; intermediate ones bearing a staminate or imperfect flower. Perianth of bristles, none. Style 2—3-cleft, deciduous. Achenium somewhat globose, hard and corky, without a tubercle.

1. *C. mariscoides.**Twigrush.*

Culm leafy, obscurely triangular, erect; leaves narrow-linear, channelled, much shorter than the culm; spikes in heads or clusters of 5—8, arranged in small, compound cymes or umbels of unequal rays, which are lateral, on very long peduncles, or terminal; glumes light tawny-brown; styles 3-cleft; achenium ovoid-globose, with a short beak left by the deciduous style. A plant much resembling the species of the last genus. Common in meadows and low grounds. Culm 12'—21' high. July—Aug.

9. CAREX.

Flowers monœcious; the two kinds are either ANDROGYNOUS, that is combined in the same spike, or else arranged in different spikes; rarely diœcious. Glumes single, 1-flowered, imbricated without order. Stamens 3, rarely 2. Stigmas 2—3. Achenium inclosed in a perigynium, or inflated persistent sac, contracted and closed at apex, and crowned with more or less of the persistent base of the style. An immense genus of perennial, grass-like plants, blooming in spring, and abounding every where.

§ 1. Stigmas 2.

A. Spikes several, androgynous.

* Spikes barren below, or above, or diœcious.

1. *C. bromoides.**Slender Swamp Sedge.*

Stem slender, leafy; spikes several, approximate, oblong-lanceolate, alter-

nate, lower ones barren, or all often so; perigynia erect, lanceolate, acuminate, bifid, longer than the lanceolate glume. A slender species common in swamps and meadows, growing in tufts. Stem 10'—20' high.

** Spikes staminate above.

2. *C. cephalophora.**Pasture Sedge.*

Stem rather stout; spikes 4—6, closely aggregated in an ovoid, bracteate head; the lower ones sometimes a little remote; perigynium compressed, broad-ovate, somewhat nerved, rough on the margin, green when mature, scarcely longer than the ovate glume, which ends in a rough point. A common species in dry fields and woods, distinguished by its short, dense, ovoid heads. Stem 6'—12' high.

3. *C. Muhlenbergii.**Muhlenberg's Sedge.*

Spikes 4—7, closely approximate, arranged in an oblong head; perigynium very broadly ovate, nearly orbicular, nerved, margined, ending in a short, bifid beak, green when mature, as long as the ovate scale, which ends in a rough point. A species easily distinguished from the last by its pale green color, its looser spikes in an oblong head and the orbicular perigynium. Not uncommon in fields and woods.

4. *C. sparganioides.**Pale Sedge.*

Spikes 7—10, ovoid; upper ones more or less aggregated; lower usually distinct, and more or less remote; perigynium broad-ovate, not nerved, rough on the margin, compressed, margined, diverging, hispid, green when mature, about twice as long as the ovate, acute glume; style short, swelling at base. A very common species, with a stout stem and pale green foliage, distinguished especially by its perigynium twice as long as the glume. It often appears with 1—3 branching spikes at base. Another form has the spikes all aggregated into a close head. Common in moist grounds.

5. *C. vulpinoides.**Fox Sedge.*

Spikes numerous, very dense, generally branching, closely aggregate, forming an oblong, dense, compound spike, usually furnished with setaceous bracts; perigynium ovate, broad at base, small, compressed, margined, nerved with a short, bifid, abrupt beak, yellowish when mature, scarcely longer than the ovate glume. A very common species in low grounds, distinguished by its densely aggregated, compound spike. The perigynium and glume vary much in shape and size, and are often ovate-lanceolate. Stem 15'—20' high.

6. *C. teretiuscula.**Spike-flowered Sedge.*

Spikes many, with short, appressed branches, forming a loose panicle, with apparently spicate divisions; bracts terminating in bristly points; perigynium ovate, acute, margined, convex on both sides, on a short stalk, broad and nerved at base, dark brown when mature, rather longer than the ovate, acute glume. A species not uncommon in swamps and bogs, distinguished by its paniculate inflorescence, with almost spicate branches. Culms 18'—24' high, growing in tufts.

7. *C. stipata.**Three-cornered Sedge.*

Culm thick, sharply 3-angled, with concave sides; spikes 6—12, aggregated, lower ones often distinct, and sometimes branching; perigynium lanceolate, round and truncate at base, destitute of a margin, on a short stalk, nerved, tapering to a long, bifid beak, yellowish when mature, and diverging, much longer than the lanceolate glume. A common species in wet grounds, sufficiently distinguished by the thick, 3-angled culm, which is 10'—18' high.

8. *C. rosea.**Rose Sedge.*

Culm low, slender; spikes several-flowered, 3—5, two uppermost usually approximate, the rest distinct, more or less remote; perigynia oblong, narrowed at base, margined, rough on the margin, compressed with a bifid beak, diverging and stellate when mature, twice as long as the broad-ovate, obtuse glume, green at maturity. A slender species, 8'—15' high. Common in low grounds and woods.

*** Stamens at the base of the spikelets.

9. *C. stellulata.**Star Sedge.*

Spikes 3—6, distinct, at length obovate or globose; perigynia ovate, broad at base, divergent, stellate at maturity, compressed, nerved, margined, terminating in a short, bifid beak, longer than the ovate, acute, whitish glume. A slender species, very common in low grounds and meadows, and distinguished by its stellate perigynia, which are quite variable in this species, being often simply ovate, with narrower glumes. It is also sometimes diœcious. Culms 8'—15' high.

10. *C. scoparia*.*Brown Sedge.*

Spikes 5—10, somewhat clavate when young, at length ovate, approximate, sometimes aggregated in a dense head; perigynia narrow-lanceolate, nerved, margined, longer than the lanceolate, acuminate glume. A common species in low grounds and meadows, with brownish or yellowish spikes when mature. Culm 1—2 ft. high.

11. *C. lagopodioides*.*Hare's-foot Sedge.*

Spikes 8—15, approximate, at length ovate; perigynia ovate-lanceolate, nerved, margined, about twice as long as the oblong-ovate, obtusish glume. A very common species much resembling the last, but distinguished by its more numerous spikes, and broader and more unequal perigynia and glumes. Culms 1—2 ft. high. It sometimes occurs with the spikes aggregated in a head.

12. *C. festucæa*.*Nodding Sedge.*

Spikes 4—8, obovate and somewhat clavate, alternate, upper approximate, lower distinct; perigynia ovate, compressed, with a narrow margin, and a short, bifid beak, shorter than the ovate-lanceolate glume. A common species in fields. There are two principal forms. The first has 5—8 roundish, approximate spikes, and a stout, rigid stem; the other has 3—5 smaller spikes, which are more or less distant. The stem is slender, flexuous above, with the upper spike frequently nodding. Culms 10'—20' high.

13. *C. straminea*.*Winged Sedge.*

Spikes 3—6, roundish-ovoid, alternate, approximate; perigynia roundish-ovate, much compressed, broadly winged, with a short, abrupt, bifid beak, somewhat longer than the lanceolate glume. A common species in fields along woods, distinguished by its broad, broadly-winged perigynia. It varies in size and form. In the large specimens the spikes are somewhat flaccid, and the broad wings of the perigynia often brownish on the edge, while in the smaller forms the spikes are more rigid, and the wings of the perigynia narrower. Culms 8'—10' high.

B. Stamens and pistils in entirely separate spikes on the same plant.

14. *C. stricta*.*Rigid Sedge.*

Staminate spikes 1—3, cylindric; fertile 2—4, long-cylindric, usually barren above, sessile; lower one often on a short peduncle; bracts rarely longer than the culm, auricled at base; perigynia ovate-acuminate, or elliptical, nerveless, not beaked, entire or very slightly emarginate, usually shorter than the narrower brownish scales. A common species growing in tufts in wet grounds. Culm 2—3 ft. high, rough on the angles, leafy; leaves glaucous, rough on the margin.

15. *C. crinita*.*Drooping Sedge.*

Culm acutely angled, rough, leafy below; staminate spikes 1—2, loose, cylindrical, often with a few perfect flowers intermixed, on long peduncles; fertile spikes 3—6, cylindric, long, densely flowered, on long, nodding, filiform peduncles; bracts long, leafy, much exceeding the culm; perigynia roundish, tapering at base, somewhat inflated, with a short, entire beak, smooth, much shorter than the narrow-oblong, rough-awned glume. A common and variable species, distinguished by its long, drooping, pedunculate spikes, and leafy bracts. Meadows and ditches. Culms 2—3 ft. high.

§ 2. *Stigmas* 3.

A. Spike single, androgynous.

16. *C. polytrichioides*.*Dwarf Sedge.*

Culms very low, setaceous; spike linear, staminate above; perigynia few, alternate, oblong, somewhat triangular, obtuse, smooth, emarginate, twice as long as the ovate, mostly obtuse glume. A very slender species, common in cold swamps and bogs. Culms 2'—4' high.

D. Spikes several; terminal one staminate, pistillate above.

17. *C. viréscens*.*Light-green Sedge.*

Spikes 2—4, oblong, alternate, erect, on short peduncles; perigynia pubescent, not beaked, longer than the ovate, pubescent, mucronate glume. A common species in woods and hill-sides. Culm and foliage light green, pubescent. Plant 10'—15' high.

18. *C. Buxbaumii*.*Sea-green Sedge.*

Spikes 3—4, oblong or obovate, short and thick, uppermost on a short peduncle, the rest almost sessile, lower ones somewhat remote, bracteolate; perigynia elliptic-ovate, somewhat 3-angled, nerved, smooth, entire at apex, scarcely equal to the ovate, acuminate or mucronate glume. A common species in wet grounds, distinguished by its short and thick spikes, smooth perigynia, and light, glaucous-green foliage. Culm 10'—18' high.

cles in wet grounds, distinguished by its short and thick spikes, smooth perigynia, and light, glaucous-green foliage. Culm 10'—18' high.

19. *C. gracillima*.*Graceful Sedge.*

Spikes 3—5, long and slender, linear, somewhat loose, remote, on long, filiform, nodding peduncles, drooping at maturity; bracts as long as the culm, or longer; perigynia oblong, 3-angled, obtuse, somewhat oblique at the orifice, longer than the oblong, awned glume. A slender, graceful species, readily distinguished by its slender, drooping spikes and pale green foliage. Culm 10'—20' high.

E. Staminate spike single, very rarely pistillate above.

* Fertile spikes small and sessile, or almost sessile, or else radical; on long peduncles.

20. *C. Pennsylvanica*.*Vernal Sedge.*

Staminate spike long, on a short peduncle; fertile spikes 1—3, approximate, ovoid, sessile, few-flowered, much shorter than the staminate barren spike; lowest with colored, setaceous bracts; perigynia ovate-globose, pubescent with a short, scarcely toothed beak about as long as the ovate-acuminate, brownish-red glume. An early species, common in the border of woods and on hill-sides. Culms 4'—10' high.

21. *C. Novæ Angliæ*.*New England Sedge.*

Sterile spike pedunculate, short and slender; fertile spikes 2—4, ovate, nearly sessile, alternate, more or less remote, few-flowered; lowest with usually a setaceous bract at base; perigynia slightly stalked, somewhat pubescent, with a comparatively long, bifid beak, somewhat longer than the ovate, acuminate glume. A slender species, growing in tufts, either erect or decumbent. It varies with the fertile spikes more or less aggregated. Culms 4'—16' long.

22. *C. umbellata*.*Umbelled Sedge.*

Staminate spike short, erect; fertile spikes several, ovate; uppermost sessile, close to the sterile; the rest solitary, on filiform, radical peduncles, equaling the others in height, forming apparently a little umbel, the radical peduncles being concealed by the leaves; perigynia 3-angled, pubescent, with a long beak, equaling the ovate, acuminate scale. A small species, growing in tufts, with long, glossy leaves, sufficiently distinguished by the filiform radical peduncles. Culms 2'—6' high.

** Upper fertile spikes nearly or quite sessile; lower often on long peduncles; all densely flowered. Perigynia more or less inflated.

23. *C. flava*.*Yellow Sedge.*

Fertile spikes 2—4, ovoid, densely flowered, upper approximate, lower remote, on usually exsert peduncles; bracts spreading, or somewhat reflexed, longer than the culm; perigynia slightly inflated, nerved, smooth, somewhat 3-angled, tapering to a long, curved, bifid beak, longer than the ovate-lanceolate glume, reflexed at maturity. Culm 6'—18' high.

24. *C. tentaculata*.*Burr Sedge.*

Fertile spikes 2—3, ovoid-cylindrical, densely flowered, approximate, upper one sessile, the others on short, more or less exsert peduncles; bracts leafy, much longer than the culm; perigynia much inflated, spreading, smooth, with a long, bifid beak, twice longer than the lanceolate, awned glume. A common species in wet grounds, where its cylindrical, burr-like spikes of perigynia are very conspicuous. Culm 10'—20' high.

25. *C. intumescens*.*Bladder-fruit Sedge.*

Barren spike pedunculate; fertile spikes 1—3, few-flowered, closely approximate, sessile, the lowest on a very short peduncle; bracts leafy, much longer than the culm; perigynia large, very much inflated, diverging, very smooth, many-nerved at base, tapering to a long, 2-toothed beak, three times as long as the ovate glume. Culm rigidly erect, leafy, with dark green foliage, 10'—20' high. A common species in low grounds and swamps, distinguished by the large, inflated perigynia, which, often $\frac{1}{2}$ ' long, are in roundish, 4—8-flowered clusters.

26. *C. folliculata*.*Tawny Sedge.*

Staminate spike small, short-pedunculate or sessile; fertile spikes 2—4, ovoid, very distant, lowest on long, exserted peduncles; bracts leafy, much longer than the culm, sheathing at base; perigynia erect, diverging, very much inflated, large, with a long, 2-toothed beak, somewhat longer than the ovate, whitish, awned glume. A tall, leafy species with broad, flat leaves; the culm and foliage usually pale yellow, 2—4 ft. high. Common in swamps.

27. *C. lupulina.**Stout Sedge.*

Barren spike nearly or quite sessile; fertile spikes 2—4, oblong-ovate, densely flowered, upper approximate, all on short peduncles, except the lowest, which is sometimes on a long, exsert peduncle; bracts leafy, longer than the culm, sheathing at base; perigynia ovoid, very much inflated at base, smooth, nerved, tapering to a long, 2-toothed, conical beak, much longer than the lanceolate, awned glume. Culm stout, 2—3 ft. high, leafy; leaves and bracts long and flat, rough on the margin. A very stout species, with large thick spikes, common in swamps.

28. *C. hystericina.**Yellow-green Sedge.*

Barren spike rarely pistillate at base or summit; fertile spikes 2—4, oblong-cylindric, densely flowered, upper one on a short peduncle, the others on long, exserted, at length drooping peduncles; bracts leafy, longer than the culm, not sheathing at base; perigynia ovoid, much inflated, nerved, smooth, tapering to a long, 2-toothed beak, longer than the oblong, mucronate glume. A common species, 1—2 ft. high, with long and rather broad, yellowish-green foliage. Wet meadows.

29. *C. scabrata.**Rough Sedge.*

Fertile spikes 3—6, cylindrical, somewhat remote, densely flowered, lower ones on long peduncles; bracts leafy, longer than the culm, not sheathing at base; perigynia somewhat inflated, ovoid, rough, at length spreading, with a bifid beak longer than the acuminate, somewhat ciliate glume. Culm sharply triangular, very rough, as also the leaves and bracts, 1—2 ft. high. A common species in swamps.

** * Lower fertile spikes on long, more or less exsert peduncles, very loosely flowered. Perigynia scarcely, if at all, inflated.*

30. *C. debilis.**Slender Sedge.*

Barren spikes very slender, rarely pistillate at summit; fertile spikes 3—4, filiform, very loosely flowered, somewhat flexuous, nodding, on long, filiform peduncles; perigynia alternate, oblong, 3-angled, somewhat inflated, tapering to a straight, bifid beak twice longer than the ovate-lanceolate, mucronate glume. Culm 3-sided, leafy, with the lower bract long and sheathing, 1—2 ft. high. Plant pale green.

31. *C. plantaginæa.**Plantain Sedge.*

Fertile spikes 3—5, oblong, erect, few-flowered, remote, on long, filiform peduncles, all, except the lowest, included within the very short, dark purple, sheathing bracts; perigynia 3-angled, not inflated, smooth, destitute of a beak, longer than the ovate, mucronate glume. Leaves all radical, very broad, 3-nerved. A common species in woods, distinguished by its very broad leaves and its purple barren spikes and bracts.

32. *C. anceps.**Wood Sedge.*

Barren spike greenish, short, linear; fertile spikes 2—4, erect, slender, sparsely flowered, uppermost nearly sessile, lower on long, exsert, 2-edged peduncles; bracts long, sheathing; perigynia ovoid, 3-angled, smooth, not inflated, beaked but not bifid, tapering at each extremity, curved obliquely at apex, somewhat longer than the glume; culm mostly compressed above. A common and quite variable species, growing in woods. The leaves are usually of medium size, but the radical leaves are sometimes very broad, resembling those of the last, for which it has been mistaken, though really very different. Culm 10'—15' high.

33. *C. digitalis.**Slender Wood Sedge.*

Barren spike short, clavate, pedunculate; fertile spikes narrow-oblong, 5—10-flowered, distant, erect, the lowest one nodding, all loosely flowered, and on long, filiform, exserted peduncles; bracts long, leafy, sheathing; perigynia 3-angled, ovate, not inflated, smooth, destitute of a beak, longer than the ovate-lanceolate glume. Culm slender, erect, at length procumbent; bracts and leaves very narrow, dark green. A slender, grassy species, not uncommon on hill-sides. Culm 5'—16' high.

** * * Lower pistillate spikes on long, exsert peduncles, all densely flowered. Perigynia not inflated.*

34. *C. granulâris.**Meadow Sedge.*

Barren spike sessile, or on a short peduncle; fertile spikes 2—4, cylindrical, nearly erect, lowest sometimes distant; perigynia roundish-ovoid, nerved, recurved at apex, with a very short, entire beak, longer than the ovate, acute glume. A common species with long, leafy bracts, exceeding the culm and yellowish spikes of mature fruit. Foliage glaucous. Culm 8'—15' high. In wet meadows.

35. *C. palléscens.**Pale Sedge.*

Barren spike sessile, or on a short peduncle; fertile spikes 2—3, oblong-ovoid, approximate, somewhat nodding at maturity; perigynia elliptic-ovate, somewhat nerved, obtuse, about as long as the ovate glume. Culm and leaves pale green, somewhat pubescent; bracts leafy, the lower one often undulate on the margin. A common species, 6'—10' high, in wet meadows.

36. *C. conoidea.**Shining Sedge.*

Barren spike on a long peduncle; fertile spikes 2—3, oblong, lower remote; bracts leafy and sheathing, not longer than the culm; perigynia oblong-conic, nerved, smooth, entire at apex, usually somewhat longer than the sharply acute or mucronate glume. A species with bright green foliage, common in meadows. Culms 6'—10' high.

F. Staminate spikes several, terminal.

37. *C. retrorsa.**Bent Sedge.*

Barren spikes 1—3, often pistillate at base; fertile spikes 4—6, oblong-cylindric, erect; upper approximate; lower remote, on a long, exserted peduncle, sometimes somewhat branched at base; all densely flowered, with long and leafy bracts; perigynia much inflated, nerved, ovoid-globose, spreading, and at length reflexed, tapering to a 2-forked beak, much longer than the lanceolate glume. A rather stout, leafy species, not uncommon on the edges of ponds and marshes. Culms 1—2 ft. high, rigid, nearly smooth.

38. *C. lanuginosa.**Woolly Sedge.*

Barren spikes 2—3, uppermost pedunculate; lower shorter, sessile; fertile spikes 1—3, cylindrical, erect, densely flowered, with long, leafy bracts, much exceeding the culm; perigynia woolly, somewhat inflated, ovoid, nerved, obtusely 3-angled, with a short, 2-toothed beak; teeth sharp, very hairy. Culms with flat leaves and bracts. A common species in wet grounds, growing 1—2 ft. high.

39. *C. filiformis.**Narrow-leaved Sedge.*

Barren spikes 2—3; uppermost pedunculate; lower shorter, sessile; fertile spikes 1—3, ovoid, or oblong-ovoid, densely flowered; bracts filiform, longer than the culm; perigynia ovoid, densely woolly, scarcely recurved, with a very short, 2-toothed beak, about equal to the ovate, acute glume; leaves and bracts filiform involute. A common species in marshes, remarkably distinguished by its very long, filiform, involute leaves and bracts. Culms 10'—18' high, slender.

40. *C. lactistris.**Lake Sedge.*

Barren spikes 1—4 erect; uppermost pedunculate; fertile spikes 2—3, oblong-cylindric, erect, remote, on short peduncles, or sessile; bracts long and leafy, much longer than the culm; perigynia ovate-oblong, somewhat inflated, nerved, with a short, straight, thick beak, with 2 spreading teeth, a little longer than the oblong, mucronate glume. A stout species, 2—4 ft. high, with broad leaves. Common in marshy grounds and along rivers.

41. *C. ampullacea.**Smooth Sedge.*

Barren spikes 2—4, oblong, cylindrical, remote, sessile, or on short peduncles; rarely nodding; bracts leafy, longer than the culm; perigynia roundish-ovoid rarely oval, much inflated, conspicuously many-nerved, tapering to a short, 2-toothed beak, longer than the lanceolate glumes, which are sometimes awnless, sometimes tipped with a rough awn of various lengths; culm obtusely triangular, smooth; foliage glaucous. A variable species common in marshy grounds, 2—3 ft. high; most abundant at the North.

42. *C. bullata.**Club Sedge.*

Barren spikes 2—3, slender, erect; fertile spikes 1—2, mostly 1, approximate, oblong-cylindric, sessile, or on short, smooth peduncles; perigynia much inflated, ovoid, spreading, nerved, tapering to a long, rough beak, much longer than the lanceolate, obtusish glume. A rather common species in wet grounds, with narrow leaves and bracts, distinguished by the short and thick usually solitary fertile spikes. Culms 1—2 ft. high.

ORDER CXL. Gramineæ.—Grass-family.

SYNOPSIS OF THE GENERA.

A. Spikelets 1-flowered, with 2 glumes and 2 paleæ, or less.

** Glumes absent, or both very minute. Paleæ 2.*

1. *LEERSIA.* Flowers perfect. Paleæ all awnless.

2. *ZIZANIA.* Flowers monœcious, paniculate; upper branches with fertile flowers and awned paleæ; lower with barren flowers and awnless paleæ.

**** Spikelets in panicles, often much contracted, and apparently racemose.**

† *Palea awnless or with inconspicuous awns.*

4. *AGRÓSTIS*. Glumes equal, or the lower somewhat longer. Palea thin, not coriaceous, obtuse, upper smaller; one often minute or wanting. Stamens usually 3.

5. *CINNA*. Lower glume somewhat shorter than the upper one; lower palea with a short, inconspicuous awn on the back below the tip; upper palea 1-nerved. Stamens 1.

6. *MULLENBERGIA*. Glumes usually acute or mucronate; lower one smaller, often minute, usually shorter. Palea mostly shorter than the glumes, surrounded by short hairs at base; lower 3-nerved, usually mucronate. Stamens 3.

8. *CALAMAGRÓSTIS*. Spikelets with a rudimentary, plumose pedicel. Glumes mostly nearly equal, longer than the flower. Palea surrounded at base by a tuft of white bristles; lower palea awnless, or with a rather inconspicuous awn attached to the back. Stamens 3.

31. *MILIUM*. Spikelets without any rudimentary pedicel; glumes apparently 2, equal. Palea 2, coriaceous. Stamens 3.

30. *PHALARIS*. Spikelets with 2 rudiments of abortive flowers, 1 on each side of the perfect flower. Palea shorter than the equal glumes.

†† *Palea with a conspicuous awn.*

6. *MULLENBERGIA*. Lower glume smaller than the upper, sometimes minute. Palea 2, herbaceous. Awn of the lower palea single, not jointed on its apex.

7. *BRACHYELYTRUM*. Spikelets with the filiform pedicel of an abortive flower lodged in the groove of the emarginate, upper palea; lower glume none; upper minute. Stamens 2.

9. *ORYZOPSIS*. Glumes nearly equal. Palea equal; lower coriaceous, enveloping the upper, with the awn jointed on to the apex. Stamens 3.

10. *ARISTIDA*. Glumes not equal, often mucronate. Lower palea with 3 awns at tip, much larger than the upper.

***** Flowers, primarily at least, arranged in simple or nearly simple spikes.**

† *Spike simple or nearly simple, terminal.*

3. *PHLEUM*. Spike simple, dense, cylindrical. Glumes mucronate or awned. Palea both present, awnless.

24. *HORDEUM*. Spikelets in threes at each joint of the rachis. Glumes side by side, mucronate, awned. Lower palea awned at apex.

†† *Spikes more than one.*

11. *SPARTINA*. Spikes very densely many-flowered; few or many, in a terminal raceme. Glumes acute or awned; upper one larger than the awnless palea.

32. *PASPALUM*. Spikelets loosely arranged in 2–4 rows, on one side of the flattened rachis, orbicular. Spikes few.

33. *PANICUM*. Flowers oblong, crowded in clusters of 2–3, in 1-sided, approximate, slender spikes.

B. Spikelets really 2-flowered, the upper perfect, the lower staminate or neutral, and in the latter case usually reduced to a single palea, so that the flower appears to have 2 glumes and 3 palea.

33. *PANICUM*. Spikelets single, with the terminal flower perfect, not surrounded by bristles, arranged in racemes, panicles, or compound spikes.

34. *SETARIA*. Spikelets surrounded by several or many bristles, and arranged in a cylindrical more or less compound spike.

35. *ANDROPOGON*. Spikelets in pairs, one pedicellate and sterile; the other with the terminal flower perfect and awned, all arranged in spikes or racemes.

36. *SORGHUM*. Spikelets in clusters of 2–3, 1 only with the terminal flower perfect and awned, the others sterile or mere rudimentary pedicels; all arranged in panicles.

37. *ZEA*. Flowers monœcious; barren flowers in terminal, numerous spikes; fertile in solitary, lateral spikes, inclosed in a leafy involucre of numerous bracts. Styles long and slender, much exsert.

C. Spikelets really 3-flowered, 2 of them imperfect or abortive, mostly reduced to single palea.

23. *HOLCUS*. Spikelets in contracted panicles; lower flower abortive or obsolete; middle flower perfect; upper flower staminate.

29. *ANTHOXANTHUM*. Spikelets in nearly simple, cylindrical spikes; the two lateral flowers neutral, reduced to awned palea; middle flower perfect, with awnless palea.

D. Glumes containing more than 2 flowers, or if only 2 both are perfect.

*** Spikelets in panicles which are often much contracted and spike-like.**

† *Lower palea with a conspicuous awn.*

12. *DACTYLES*. Spikelets 3–6-flowered, in dense, 1-sided clusters, forming a crowded panicle. Glumes awned, somewhat rough and ciliate on the back, as also the lower palea.

17. *FESTUCA*. Spikelets 8–10 flowered, in open panicles, or contracted, spikeate ones. Glumes unequal. Palea rounded on the back, entire, awned at the apex.

13. *BROMUS*. Spikelets 5–12 flowered, in loose, at length drooping panicles. Glumes unequal. Lower palea mostly 2-cleft, with a straight awn below the tip.

25. *AIRA*. Spikelets with 2 perfect flowers, rarely a third imperfect one. Flowers hairy at base. Lower palea awned on the back below the middle.

26. *DANTHONIA*. Spikelets 7-flowered, in a loose, racemose panicle. Lower palea 2-toothed at apex, with an awn composed of the three twisted nerves rising from between the teeth.

27. *AVENA*. Spikelets 3–6-flowered; uppermost imperfect. Glumes' nn-

equal. Lower palea rounded on the back, with a twisted awn, consisting only of the middle nerve, and arising on the back below the 2-cleft tip.

†† *Lower palea awnless.*

13. *GLYCERIA*. Spikelets nearly terete, 3–13-flowered. Flowers perfect, sessile, deciduous, the rachis separating into pieces at the joints. Glumes short, unequal, persistent after the falling of the flowers. Palea nearly equal; lower 7-nerved.

14. *BRIZOPYRUM*. Dioecious. Spikelets compressed, 5–10-flowered, in a dense, spikeate panicle. Leaves revolute.

15. *POA*. Spikelets compressed, 2–7-flowered, in open panicles, clothed with more or less of a web-like down, but not bearded at base. Upper palea 2-toothed, deciduous, together with the larger, 5-nerved, lower palea.

16. *ERAGRÓSTIS*. Spikelets compressed, 2–40-flowered, in open panicles, not webbed or bearded at base. Palea free from the grain; lower palea 3-nerved; upper one persistent after the rest of the flower has fallen.

17. *FESTUCA*. Spikelets 3–10-flowered; flowers not webbed nor bearded at base. Palea rounded on the back; upper one adhering to the inclosed grain, which is somewhat downy at apex.

19. *PIRAGMITES*. Spikelets 3–7-flowered; flowers with a copious silky beard at base; lower flower neutral or with 1 stamen; the others perfect with 3 stamens. Glumes very unequal.

**** Spikelets in simple, terminal spikes.**

20. *TRITICUM*. Spikelets 3–10-flowered, attached singly to the joints of the rachis, with the side against it. Glumes 2, on opposite sides of the spikelet.

21. *SECALIS*. Spikelets solitary at each joint of the rachis, 2–3-flowered. Glumes 2 opposite, subulate, shorter than the flowers.

22. *LILIUM*. Spikelets 5–9-flowered, solitary at the joints, and attached edgewise. Glume single on the outside of the spikelets, except at the terminal spikelet, which has 2.

23. *ELYNUS*. Spikelets 2–7-flowered, in clusters of 2–4 at each joint of the rachis. Glumes side by side on the front of the spikelet, rarely none.

1. *LEERSIA*.

Spikelets 1-flowered, compressed, perfect, in second racemes, arranged in panicles. Palea 2, compressed, carinate, awnless, nearly equal; lower broader. Stamens 1–6. Stigmas plumose. *Per.*

1. *L. oryzoides.*

Cut-Grass.

Culm rough backwards, with hooked prickles, as also the lanceolate leaves; panicle sheathed at base, with numerous diffuse branches; stamens 3; palea whitish, ciliate on the keel. A common and very rough grass in wet grounds, well known by the hooked prickles of its stem and leaves, which are sharp, rough, and readily cut the flesh. Culm 1–2 ft. high. *Aug.*

2. *L. Virginica.*

White Grass.

Culm slender, branching, geniculate or decumbent at base, clothed with recurved bristles at the nodes; leaves linear-lanceolate, rough backwards, but not so much as in the last; sheaths rough backwards; panicle simple; flowers appressed on the slender branches; stamens 2; palea greenish, slightly ciliate. A more slender species than the last, with the stem and leaves much less rough; and a simpler panicle. Culm 15'–20' high. *Aug.*

2. *ZIZANIA.*

Flowers monœcious. Spikelets 1-flowered, both kinds in the same panicle. Glumes mostly wanting. Palea of the barren flowers awnless, of the fertile, with a straight awn. Stamens 6. Styles 2. *Per.*

1. *Z. aquatica.*

Indian Rice.

Culm hollow, smooth, tall; leaves flat, very long, linear-lanceolate, smooth, serrulate; panicle very large, pyramidal; lower branches spreading, staminate; upper branches erect, pistillate; pedicels of the pistillate flowers clavate; lower palea with a long awn; grain linear. A tall, aquatic grass, on the shallow borders of streams, and of swamps, salt or fresh. Culm 4–8 ft. high. The spikelets and fruit are very deciduous. Rather common. *July–Aug.*

3. *PHLEUM.*

Glumes 2, carinate, much longer than the palea, mucronate or awned. Palea 2, unequal, truncate, included in the glumes. Stamens 3. *Per.*

1. *P. pratense.*

Timothy. Herd's Grass.

Culm erect, simple, smooth, sometimes bulbous at base; leaves flat, glaucous; flowers in a long, dense, simple, terminal, cylindrical spike; glumes ciliate on the back, truncate, tipped with a very short awn; anthers purplish. A very valuable species, frequently cultivated for hay, and thoroughly naturalized. Culm 2–4 ft. high. *June–July.*

4. *AGRÓSTIS.*

Spikelets 1-flowered, paniculate. Glumes 2, subequal, or the

lower one larger, mostly longer than the paleæ. Paleæ 1—2; lower one larger, often awned; upper one often wanting, or minute. Stamens 3. Caryopsis free. *Per.*

* *Upper palea minute or wanting.*

1. *A. scabra.* *Hair Grass.*

Culm erect, very slender; leaves narrow, short, somewhat rough; lower ones involute; upper shorter and very narrow; panicle large, very loose, with capillary diverging branches, which bear the purplish flowers near the extremities; lower palea mostly awnless, or with a very short awn. A delicate grass in fields and wet places that have become dry, distinguished by its large, capillary, very delicate panicle, with its branches whorled. Culm 1—2 ft. high. *June.*

2. *A. canina.* *Dog's Bent-Grass.*

Culms slender, mostly decumbent; radical leaves setaceous, involute; those of the culm flat, linear; panicle short and loose, somewhat spreading, with slender branches; lower palea awned on the back; awn long, and at length bent; upper palea minute. An introduced species, common in the meadows of N. England, distinguished by its long awn. The spikelets at first green, become purplish. Culm 1—2 ft. high. *July—Aug.*

** *Upper palea present.*

3. *A. vulgâris.* *Red-top. Herd's Grass in Penn.*

Culm mostly erect, slender; leaves linear, with smooth sheaths; ligule short, truncate; panicle spreading, with slender, purplish branches; lower palea 8-veined, twice as long as the upper, equaling the glumes, rarely awned. A valuable grass, introduced and thoroughly naturalized, distinguished by its cylindrical, purplish panicle, with slender, spreading branches. Culm 1—2 ft. high. *July.*

4. *A. alba.* *White-top.*

Culm erect, or ascending above, decumbent, or rooting at base; leaves linear; sheaths smooth; ligule narrow-oblong; panicle narrow, at length contracted, with slender, roughish branches; lower palea 5-veined, rarely awned, shorter than the glumes. Another introduced species, equally common with the last, distinguished by the narrow, whitish panicle, and decumbent stem. Culm 1—2 ft. high. *July.*

5. *CINNA.*

Spikelets 1-flowered, crowded in an open panicle. Glumes 2, carinate; lower one smaller. Flower pedicellate within the glumes. Paleæ 2, the lower longest, with a short awn on the back. Stamen 1. *Per.*

1. *C. arundinæa.* *Reed Grass.*

Culm tall, erect, smooth; leaves linear-lanceolate, flat, rough on the margin; ligule long, lacerated; panicle large, compound, spreading, at length contracted; lower glume considerably shorter than the lower palea, and about equal to the upper palea; spikelets green, rarely purplish; awn scarcely, if at all exceeding the palea. A tall, rank grass, not uncommon in wet grounds. Culm 2—5 ft. high. *Aug.*

6. *MUHLENBERGIA.*

Spikelets 1-flowered, in more or less contracted, often spicate panicles. Glumes acute, mucronate, persistent; lower one smaller, often minute. Paleæ 2, usually bearded at base, inclosing the grain, and deciduous with it; lower more or less mucronate or awned at apex. Stamens 3. *Per.*

* *Lower palea more or less mucronate, not awned.*

1. *M. sobolifera.* *Drop-seed Grass.*

Culm slender, ascending, slightly branched; leaves linear, short; panicles much contracted, terminal and axillary, with simple, filiform branches; glumes acute, somewhat shorter than the equal palea; lower palea short, mucronate. A slender species, common in rocky woods, distinguished by its simple panicles with filiform branches. Culm 1—2 ft. high. *Aug.*

2. *M. Mexicana.* *Mexican Drop-seed.*

Culm erect, ascending, very branching, and very leafy above; leaves linear, short; panicles numerous, terminal and axillary, contracted, densely flowered; branches somewhat spicate; glumes acute, unequal; upper glume as long as the very acute, lower palea. A common grass in damp grounds, distinguished by its numerous, densely flowered, contracted panicles. Culm 1—3 ft. high. *Aug.*

3. *M. glomerata.* *Clustered Drop-seed.*

Culm erect, smooth, simple, or with a few appressed branches; leaves erect

flat, rough; panicle narrow-oblong, contracted into a kind of interrupted, clustered spike, on a long peduncle; glumes nearly equal, awned, with the awns twice as long as the very acute or mucronate palea. A species rather common in bogs, distinguished by its nearly simple spicate panicle. Culm 1—2 ft. high. *Aug.*

** *Lower palea awned.*

4. *M. sylvatica.* *Wood Drop-seed.*

Culm ascending, very branching; branches diffusely spreading; leaves lanceolate, with smooth sheaths; panicles contracted, densely flowered; glumes subequal, mucronate, nearly equaling the long-awned, lower palea. A rather common species, in rocky woods, distinguished by the very branching culm and dense panicles. 2—3 ft. high. *Sept.*

5. *M. Wildenôvii.* *Slender Drop-seed.*

Culm slender, erect, nearly or quite simple; leaves lanceolate, with pubescent sheaths; panicle slender, contracted, loosely flowered, with remote, filiform branches; glumes rather unequal, acute, half as long as the long-awned palea. A slender species, common in rocky woods, distinguished by its nearly simple stem and contracted panicle, with its filiform branches. Culm 2—3 ft. high. *Aug.*

7. *BRACHYELYTRUM.*

Spikelets 1-flowered, with a filiform pedicel of a second abortive flower, arranged in a simple, appressed, racemose panicle. Lower glume wanting; upper minute, persistent. Paleæ 2, inclosing the grain; lower tipped with a long, straight awn. Stamens 2. *Per.*

1. *B. aristatum.* *Bearded Drop-seed.*

Culm erect, simple, slender; leaves lanceolate, flat, with somewhat pubescent sheaths; flowers large, nerved, in a slender panicle, consisting of simple, appressed branches, resembling a spike or raceme; awn as long as the flower; abortive flower lodged in the groove in the back of the upper palea. A slender grass, rather common in rocky woods. Culm 1—3 ft. high. *June.*

8. *CALAMAGRÖSTIS.*

Spikelets 1-flowered, often with a minute, rudimentary pedicel of an abortive flower, in a loose panicle, varying to a spicate one. Glumes 2, carinate, nearly equal in length, longer than the paleæ, which are surrounded by a tuft of white bristles. Lower palea awned on the back, below the tip, or awnless, mostly longer than the upper one. Stamens 3.

1. *C. Canadensis.* *Blue-joint.*

Culm simple, tall, stout, rigid; leaves with smooth sheaths, linear-lanceolate; panicle oblong, loose; lower palea 3—5-nerved, nearly as long as the lanceolate glumes, equaling the tuft of hairs surrounding it, and with a very fine awn on the back below the tip, scarcely exceeding it. A rank, reedy grass, 2—5 ft. high, with somewhat glaucous foliage, rather common in wet grounds. *July—Aug.*

2. *C. arenaria.* *Sea-sand Reed.*

Culm stout and rigid, erect, arising from stout, creeping rhizomas; leaves smooth and glaucous, very acute and involute at extremity; panicle contracted into a dense, thick spike, with short, appressed branches; glumes nearly equal, somewhat longer than the equal palea, compressed, carinate; lower palea somewhat mucronate or awned; tuft of hairs much shorter than the palea; ovary with lanceolate scales at base much longer than itself. A stout grass 2—3 ft. high, common on sandy beaches. *Aug.*

9. *ORYZOPSIS.*

Spikelets 1-flowered. Glumes nearly equal, mostly longer than the flower. Lower palea coriaceous, at length involute, and inclosing the upper equal palea and the grain, tipped with a straight, deciduous awn. Stamens 3. Scales at the base of the ovary mostly 2, manifest. *Per.*

1. *O. asperifolia.* *Mountain Rice.*

Culm nearly naked, clothed with mere sheaths of leaves, erect, simple; leaves few, long, erect, radical, narrow-linear, rough on the margin; panicle reduced to a nearly simple, racemose, few-flowered spike, the lower branches bearing only 1—3 flowers; paleæ whitish, somewhat pubescent; lower one with a long, straight awn at least twice its own length; caryopsis white, as large as a rice grain, farinaceous. A common inhabitant of rich, wooded hill-sides, where its long, rigid leaves remain green through the winter. Culm 6'—15' high. *May.*

2. *O. melanocarpa.**Black Millet.*

Culm erect, simple, leafy; leaves lanceolate, acuminate, flat, with sheaths bearded at the throat; panicle mostly simple, consisting of loose racemes; glumes acuminate, mucronate; palea somewhat hairy, nearly black when mature; lower one tipped with a long, straight awn, nearly an inch long; fruit black. A leafy species, remarkably distinguished by its black fruit, rather common in rocky woods. Culm 2—3 ft. high. *July—Aug.*

10. *ARISTIDA.*

Spikelets 1-flowered. Glumes 2, unequal, often mucronate; palea pedicellate; lower tipped with 3 awns; upper palea much smaller, minute. Stamens 3. Stigmas plumose.

1. *A. dichotoma.**Poverty Grass.*

Culms tufted, dichotomously and very branching; leaves very narrow, more or less revolute; spikelets on clavate pedicels, in short, appressed racemes; lateral ones minute, middle one as long or longer than the palea, bent or twisted. A common grass in sandy fields, distinguished by its very dichotomous culm, which is 6'—12' high. *Aug.—Sep.*

11. *SPARTINA.*

Spikelets 1-flowered, much compressed, arranged in two rows on a triangular axis, forming dense racemose spikes. Glumes 2, compressed, very much carinate, acute or mucronate, rough or bristly on the keel; upper one the largest, longer than the awnless palea. Stamens 3. Styles distinct, long.

1. *S. polystachya.**Marsh Reed-Grass.*

Culm erect, rigid, tall and stout; leaves broad, rough on the margin and somewhat beneath, very long, involute toward the extremity; spikes purplish, very numerous, in a dense raceme; glumes mucronate; palea equal, twice as long as the lower glume. A tall, rank grass, growing in salt marshes. Culm 3—8 ft. high. *Aug.*

2. *S. juncæa.**Salt Rush-Grass.*

Culm erect, slender; leaves very narrow, involute the whole length; spikelets few, 2—5, on short, smooth peduncles; uppermost sometimes sessile; glumes acute, lower one much shorter than the lower palea. A much slenderer species than the last, with very fine, almost capillary, involute leaves, growing on the sea-beach and in salt marshes. Culm 1—2 ft. high. *Aug.*

3. *S. glabra.**Smooth Marsh-Grass.*

Culm tall, erect, very smooth and somewhat succulent; leaves flat, very smooth, very long, tapering to a very long, fine point, which soon becomes involute, smooth on the margin; spikes several, 5—15, erect, sessile; upper glume scarcely exceeding the equal palea. A rank species, distinguished by the smoothness of all its parts, and the comparatively few sessile spikes. Culms 2—6 ft. high. *Aug.*

12. *DACTYLIS.*

Spikelets 2—3-flowered, aggregated in dense clusters, forming a dense, branching, 1-sided panicle. Glumes unequal, carinate, mucronate. Stamens 3. *Per.*

1. *D. glomerata.**Orchard Grass.*

Culm erect, somewhat rough; leaves linear-lanceolate, rough, somewhat glaucous, carinate; panicle dense, secund, with remote branches; glumes very unequal; anthers large, yellow. A common grass, introduced and naturalized in shaded fields, especially orchards. Culm 2—3 ft. high. *June.*

13. *GLYCERIA.*

Spikelets several-flowered, mostly cylindrical and not flat. Flowers sessile, deciduous by separation of the joints of the rachis, leaving the membranous, somewhat unequal glumes. Palea nearly equal; lower one 5—7, mostly 7-nerved. Stamens 2—3. *Per.*

* *Spikes rather dense, ovate or oblong.*

1. *G. Canadensis.**Rattlesnake Grass.*

Culm erect, smooth; leaves rough, somewhat glaucous; panicle very large, somewhat pyramidal, with long, capillary, spreading branches, which at length are drooping; spikelets rather large, ovate, short, tumid, 6—8-flowered, drooping; lower palea acute, longer than the obtuse, entire upper one; stamens 2. A stout, showy grass, 2—3 ft. high, distinguished by its large, swelling, drooping spikelets. *July.*

2. *G. elongata.**Manna-Grass.*

Culm erect, smooth; leaves very long, rough; panicle contracted, narrow, very long, with racemose, somewhat secund, nodding, appressed branches; spikelets 3—5-flowered, erect, tumid, ovoid; lower palea obtuse, somewhat longer than the very obtuse upper palea. A common species in wet meadows and woods, distinguished by its short, ovoid spikelets, arranged in a very long, racemose panicle. Culm 2—3 ft. high. *June—July.*

3. *G. nervata.**Nerved Manna-Grass.*

Culm erect, smooth; leaves long, rough above, with roughish sheaths; panicle large, broad, diffuse, with capillary, at length drooping branches; spikelets small, very numerous, oblong-ovate, 3—4-flowered, purplish; palea obtuse, nearly equal, conspicuously veined; upper one 2-toothed; stamens 3. A common meadow grass, 1—3 ft. high. *June.*

4. *G. pallida.**Pale Manna-Grass.*

Culm smooth, creeping at base and then ascending; leaves flat, somewhat glaucous beneath, pale green above; panicle rather large, nearly simple, very loose, with capillary, erect, spreading, roughish, few-flowered branches; spikelets lanceolate, about 5-flowered, 5-veined, truncate at apex, minutely 5-toothed; upper one 2-toothed. Common in shallow water and very wet swamps. Culm 1—3 ft. high. *July.*

5. *G. aquatica.**Water Manna-Grass.*

Culm erect, smooth, stout, leafy; leaves broadly linear, thin; panicle large and long, very much and diffusely branched; branches somewhat erect, at length spreading; spikelets narrow-oblong, 5—8-flowered, mostly purplish lower palea truncate; upper one shorter, 2-toothed. A stout, showy species, common, especially in Northern districts. Culm 3—5 ft. high. *July.*

* *Spikelets linear, loosely flowered.*

6. *G. fluitans.**Floating Manna-Grass.*

Culm compressed, ascending from a creeping, rooting base; leaves broad-linear, short, very smooth; panicle very long, contracted, with nearly simple, racemose branches; spikelets 7—11-flowered, an inch or more long, appressed; lower palea obtuse, mostly somewhat longer than the upper one. An aquatic species, distinguished from the preceding by its long spikelets, and from the following by its obtuse flowers. Culm 2—4 ft. long. Rather common in shallow waters. *June.*

7. *G. acutiflora.**Pointed Manna-Grass.*

Culm smooth, compressed, ascending from a creeping, rooting base; leaves narrow, small, shorter than in the last; panicle very long, much contracted, with nearly simple, racemose branches; spikelets very long, from 1'—1½', 5—10-flowered; lower palea acute, shorter than the upper one, which tapers to a long, acuminate point. A species much resembling the last. It is found in similar situations, but is distinguished by its much longer and very acute flowers. Culm 2—3 ft. long. *June.*

14. *BRIZOPYRUM.*

Spikelets 5—12-flowered, compressed, arranged in a very dense, spicate or somewhat capitate panicle. Glumes 2, carinate; lower ones nerved. Palea 2; lower palea somewhat coriaceous, and obscurely nerved, acute. Ovary pedicellate. Flowers often polygamously dioecious. *Per.*

1. *B. spicatum.**Quaking-Grass.*

Culms smooth, tufted, rigidly erect, very leafy above; leaves long, rigid, involute, acute; panicle densely spicate, with short branches, crowded with sessile spikelets; flowers smooth, dioecious; stigmas of the pistillate flowers very long, plumose. A common grass of the salt marshes, growing in tufts, 6'—15' high. *Aug.*

15. *PÖA.*

Spikelets compressed, ovate or oblong, few-flowered, in loose, open panicles. Glumes usually shorter than the flowers; the lower one smaller. Lower palea scarious on the margin, 5-nerved, mostly clothed at base with a soft, web-like down. Upper palea smaller, 2-toothed, deciduous with the rest of the flower. Stamens 2—3. *Per., except No. 1.*

1. *P. annua.**Low Meadow-Grass.*

Culms low, mostly decumbent or spreading, somewhat compressed; leaves short, smooth, with smooth sheaths; panicle nearly as long as broad, with mostly solitary, at length horizontal branches; spikelets 3—6-flowered, on very

short pedicels, much crowded; flowers slightly downy near the apex. A low, annual species, 3'—6' high, common every where, especially in cultivated grounds and around dwellings, and forming a short, soft turf. *May—Nov. An.*

2. *P. serotina.* *False Red-top.*

Culm round, slender, smooth; leaves linear, flat; ligules long, conspicuous; panicle large, very diffuse, on a long peduncle; branches slender, in half-whorls of fours or fives, rough, branching and numerous-flowered above; spikelets 2—3-flowered, on short pedicels, greenish, mostly yellow at tip, often tinged with purple; glumes lanceolate, very acute; flowers webbed only at base. A very slender and rather tall species, 2—3 ft. high; common in meadows and along streams. *June—July.*

3. *P. trivialis.* *Rough Meadow-Grass.*

Culm erect, terete, somewhat rough; leaves rough on the margin, with rather rough sheaths; ligule long, acute; panicle pyramidal, diffuse; branches in half-whorls of 4—5; spikelets 2—3-flowered, nearly sessile, densely crowded on the branches; flowers webbed at base. A valuable grass, 2—3 ft. high; common in meadows and pastures; introduced. *July.*

4. *P. pratensis.* *Meadow-Grass.*

Culm erect, round, smooth; leaves with smooth sheaths; ligules short, truncate; panicle pyramidal, diffuse; branches spreading, in half-whorls of 4—5; spikelets 3—5-flowered, nearly sessile, densely crowded on the branches. A very valuable pasture-grass, naturalized and growing every where, resembling the last, but distinguished by its smooth culm and sheaths, and short, truncate ligule. Culm 1—3 ft. high. *May—July.*

5. *P. compressa.* *Blue-Grass.*

Culms compressed, ascending from a creeping base; leaves linear, short, deep bluish-green; ligule short, truncate; panicle contracted and dense, somewhat secund; branches short, 2—3 together in half-whorls, crowded through nearly their whole length, with the nearly sessile, 3—7-flowered, compressed spikelets; flowers webby at base. A slender species, 6'—15' high, common in tufts, distinguished by its slender, compressed culm, and bluish-green aspect. *June—July.*

16. *ERAGRÖSTIS.*

Spikelets 2—40-flowered, compressed, in an open panicle. Glumes mostly shorter than the flowers. Lower palea not webbed at base, 3-nerved. Upper palea persistent after the rest of the flower has fallen.

1. *E. megastachya.* *Spear-Grass.*

Culm branching at base, spreading or decumbent; leaves flat, smooth; panicle pyramidal; branches usually naked on the axils; spikelets very large, oblong or ovate-oblong, 6—30-flowered, of a dark, almost lead-color, with short pedicels. A very showy grass, naturalized and rather common in sandy fields, distinguished by its strong and rather unpleasant odor. Culm 10'—20' high. *Aug. An.*

2. *E. capillaris.* *Slender Spear-Grass.*

Culms slender, simple, tufted; leaves flat, smooth, the sheaths often hairy; panicle very large and delicate, with diffuse, capillary branches, naked in the axils; spikelets 2—4-flowered, on long, filiform pedicels. A very delicate species, 1—2 ft. high, with a very large, compound, capillary panicle. Common in sandy fields. *Aug. An.*

3. *E. spectabilis.* *Showy Spear-Grass.*

Culm simple, tufted, smooth, erect; leaves long, rigid, mostly smooth; lower sheaths more or less pubescent, sometimes smooth; panicle very large, capillary; branches spreading, rigid, at length reflexed, usually bearded in the axils; spikelets oblong or oblong-linear, 7—10-flowered, purplish; lateral ones on appressed pedicels of their own length. A slender species with a long, capillary panicle, distinguished from the last by its more numerous-flowered spikelets and bearded axils. Culm 1—3 ft. high. *Aug—Sep. An.*

17. *FESTUCA.*

Spikelets 3—10-flowered, in open or racemose panicles. Flowers not webbed at base. Glumes unequal, usually carinate. Palea rounded on the back, entire, acute, and often awned at apex. Upper palea usually adhering to the ripe caryopsis. Stamens mostly 3.

1. *F. tenella.* *Slender Fescue-Grass.*

Culm very slender, wiry, mostly simple; leaves very narrow; panicle simple, with racemose branches, contracted so as to resemble a spike; spikelets 6—8-flowered; palea subulate, tipped with an awn shorter than itself. A very slender grass with fine, setaceous leaves, 6'—12' high. Common in dry soils and along road-sides. *June—July.*

2. *F. elatior.* *Tall Fescue-Grass.*

Culm smooth, erect; leaves broad-linear; panicle open, loosely branching, with spreading, drooping branches; spikelets crowded, 4—6-flowered; lower palea awnless. A tall grass, 2—4 ft. high, rather common in meadows and pastures. *June. Per.*

3. *F. pratensis.* *Meadow Fescue-Grass.*

Culm erect, smooth; leaves linear; panicle open, with mostly simple, drooping branches, somewhat secund; spikelets 6—11-flowered; lower palea acute, awnless. A valuable grass, much resembling the last, and of which it is probably a variety. Common in meadows and pastures. Culm 2—3 ft. high. *June—July. Per.*

18. *BRÖMUS.*

Spikelets 5—15-flowered, panicle. Glumes unequal, shorter than the flower, nerved. Lower palea convex or somewhat carinate on the back, mostly bifid at apex, with an awn proceeding from below the tip. Upper palea convolute, at length adhering to the caryopsis at the groove. Stamens 3.

1. *B. secalinus.* *Cheese.*

Culm smooth, erect; leaves flat, rough above, with margins and sheaths smooth; panicle spreading, with branches nearly simple, drooping; spikelets ovate, cylindrical, tufted, smooth, about 10-flowered; awn of the lower palea usually shorter than the spikelet. A coarse grass with a showy panicle; very common and troublesome in wheat and other grain fields. Culm 2—3 ft. high. *June. An.*

2. *B. ciliatus.* *Brome-Grass.*

Culm erect, smooth or hairy, slender; leaves broad, linear, flat, large, smooth or hairy; sheaths usually densely pubescent near the top; panicle very loose, compound; branches long, at length divergent, drooping; spikelets 7—12-flowered; lower glume 1-nerved; upper glume 3-nerved; flowers tipped with awns more than half their own length; upper palea ciliate with stiff bristles; lower palea varying from nearly smooth to silky-pubescent over its whole surface. A very coarse, variable grass, common in moist and rocky woodlands. Culm 2—4 ft. high. *July—Aug. Per.*

19. *PRAGMÏTES.*

Spikelets 3—8-flowered. Flowers with tufts of white, silky hairs at base. Lower flower either neutral, or with a single stamen; the others perfect with 3 stamens. Glumes 2, shorter than the flowers, carinate, very unequal. Lower palea subulate, more than twice as long as the upper. *Per.*

1. *P. communis.* *Water-Weed.*

Culm erect, smooth, very stout; leaves very long, broad-lanceolate, glaucous; panicle very large, loosely branched, at length diffuse; branches in half-whorls, erect, spreading, slender; spikelets 3—5-flowered, erect. A tall, rank, aquatic grass, found on the borders of ponds and streams, growing 6—10 ft. high. At a distance it somewhat resembles a field of Indian-corn. *July—Aug.*

20. *TRITICUM.*

Spikelets 3—8-flowered, spicate, each attached to a separate joint of the rachis. Glumes 2, nearly equal, opposite, ovate. Palea 2; lower one awned or mucronate at tip, convex on the back; upper compressed, ciliate on the nerves. Stamens 3.

1. *T. vulgare.* *Wheat.*

Culm erect, terete, smooth; leaves linear, somewhat rough above; spikelets somewhat 4-sided; spikelets crowded, about 4-flowered; glumes ventricose; awns longer than the flower. The most valuable species of grain cultivated. There are many varieties, in the appearance of the seed, mode of growth, length of the awns, &c., which are found in cultivation. Culm 2—4 ft. high. *June. An.*

2. *T. repens.*

Culm erect, arising from a creeping rhizoma; leaves linear-lanceolate, somewhat rough or hairy above; spike compressed; spikelets remote, alternate, 4—8 flowered; glumes 5—7-veined, lanceolate; awn none, or not half the length of the flower. A naturalized species, growing as a weed in gardens, where it propagates rapidly by its creeping root-stalks, and is extremely difficult to eradicate. Culm 1—2 ft. high. *June—Aug. Per.*

21. SECALÆ.

Spikelets 2—3-flowered, spicate, each attached to a single point of the rachis; lower flowers sessile and opposite; upper often abortive. Glumes subulate, opposite, shorter than the flowers. Lower palea ciliate on the keel and margin, tipped with a very long awn; upper often 2-toothed at apex. *An.*

1. *S. cereale.**Rye.*

Culm tall, erect, slender, hairy below the spike; leaves rough above and on the margin, glaucous; spike, long, compressed; awns long and straight. A very valuable grain, universally cultivated. Culm 3—6 ft. high, with a spike 3'—5' long. *June.*

22. LILIUM.

Spikelets many-flowered, sessile, solitary, placed edgewise on the rachis. Glume single, except in the terminal spikelet. Palea nearly equal; lower one awned or mucronate; upper mostly 2-toothed.

1. *L. perenne.**Darnel.*

Culm erect, smooth; leaves linear-lanceolate, light-green; spikelets 7—9-flowered, alternate, in 2 opposite rows; lower palea usually awnless, sometimes short-awned. A not uncommon grass, 1—2 ft. high, in meadows and pastures. *June. Per.*

23. ELYMUS.

Spikelets 2—6-flowered, attached, 2—4 together at each joint of the rachis. Glumes 2, side by side, and not opposite, nearly equal, subulate. Lower palea convex on the back, mostly awned at apex. *Per.*

1. *E. Virginicus.**Wild Rye.*

Culm erect, stout, smooth; leaves broad-linear, rough, deep green; spike erect, rigid, thick, on a short peduncle, which is usually sheathed; spikelets mostly in pairs, 2—3-flowered, smooth; glumes rough, lanceolate, tipped with a short awn, thickened at base, as long as the flowers; lower palea with a short awn. A coarse, rough grass, 2—4 ft. high, somewhat resembling Rye. Very common in damp thickets and along rivers. *Aug.*

2. *E. Canadensis.**Nodding Rye-Grass.*

Culm erect, rather stout; leaves broad-linear, dark-green or glaucous; spike loose, somewhat nodding above the middle, on an exerted peduncle; spikelets mostly in pairs, 2—5-flowered; flowers hairy and rough; glumes lance-subulate, short-awned; lower palea tipped with a long awn. Common on rich, low banks of rivers. Culm 3—5 ft. high. *July—Aug.*

3. *E. hystrix.**Lyme Grass.*

Culm erect, smooth; spike erect, very loose; rachis flexuous; spikelets 2—3-flowered, 2 together, in remote, diverging clusters, quickly deciduous; glume none, or minute and awn-like; lower palea tipped with a long awn, twice the length of the flowers. A conspicuous grass, 2—4 ft. high, common in moist and rocky woods, and at once distinguished by its remote pairs of diverging, long-awned spikelets, which are almost horizontal. *July.*

24. HORDEUM.

Spikelets 1-flowered, with an awn-like, rudiment at base on the inner side, 3 at each joint of the rachis; lateral ones often abortive. Glumes 2, side by side, and not opposite, subulate. Lower palea long-awned at apex. Grain adherent to the palea.

1. *H. vulgare.**Barley.*

Culm erect, smooth; leaves broad-linear, nearly smooth; spike erect, thick; spikelets all fertile; glumes shorter than the flowers; lower palea very long-awned; fruit arranged in 4—6 rows. A grain frequently cultivated for malting. Culm 2—3 ft. high. *May. An.*

2. *H. distichum.**Two-rowed Barley.*

Culm erect; leaves broad-linear, rough above; spike linear, compressed, lateral

spikelets abortive, destitute of awns; lower palea long-awned; fruit in 2 rows. Another species cultivated for the same purposes as the last, distinguished by its 2-rowed spikes of fruit. Culm 2—3 ft. high. *June. An.*

25. AÏRA.

Spikelets 2-flowered, in an open panicle, both flowers perfect. Glumes 2, nearly equal, longer than the flowers. Palea nearly equal, hairy at base; lower palea nerved, awned on the back below the middle.

1. *A. flexuosa.**Hair Grass.*

Culm erect, slender, smooth, nearly naked; leaves mostly radical and tufted at base, setaceous, involute; panicle open, loose, with spreading, capillary branches, which are mostly in pairs; glumes no longer than the flowers; awn geniculate, longer than the glumes. An elegant grass, growing in tufts, on dry hill-sides, 1—3 ft. high. Very common. *June. Per.*

26. DANTHONIA.

Spikelets 3—8-flowered, in a spicate panicle. Glumes 2, longer than the flowers. Lower palea nerved, 2-toothed at apex, with a twisted awn arising from between the teeth; upper palea obtuse, entire. *Per.*

1. *D. spicata.**Oat Grass.*

Culms slender, erect, ascending, tufted; leaves mostly radical, setaceous, somewhat involute; cauline leaves much shorter than the radical ones, erect, with sheaths hairy at the throat; panicle slender, contracted, like a raceme, somewhat secund, with simple branches, bearing a few, appressed, 7-flowered spikelets; lower palea hairy, with a twisted awn twice its length. A common grass, growing in tufts in dry fields and open woods. Culm 1—2 ft. high. *June—July.*

27. AVENA.

Spikelets 2—7-flowered in panicles; uppermost flower imperfect. Glumes 2, large and somewhat unequal. Lower palea rounded on the back, nerved, 2-toothed at apex, with a twisted or bent awn on the back.

1. *A. sativa.**Oat.*

Culm erect, smooth; leaves broad-linear, rough above; panicle loose, with slender, drooping branchlets; spikelets 2—4-flowered, on slender, drooping peduncles; lower flower awned, rarely both awnless; upper palea closely investing the grain. A very valuable grain, universally cultivated. Culm 2—3 ft. high. It varies with awnless flowers, and blackish grains. *June. An.*

28. HÓLCUS.

Spikelets 2—3-flowered, in a contracted panicle. Flowers pedicellate, shorter than the glume; lowest flower neutral, often wanting; middle flower perfect, awnless; upper staminate, with its lower palea awned on the back. *Per.*

1. *H. lanatus.**Velvet Grass.*

Culm and broad-linear leaves pale green, covered with soft, velvety down; panicle oblong, dense-flowered, whitish, tinged with purple; staminate upper flower with a recurved, short awn. A quite common grass, in wet meadows, distinguished by the soft pubescence of its culm and leaves; 10'—20' high. *June—July.*

29. ANTHOXÁNTHUM.

Spikelets 3-flowered, in a spicate panicle; lateral flowers neutral, consisting of 1 hairy palea, awned on the back; central flower perfect, with 2 short, awnless palea, and 2 stamens. Glumes 2, very unequal, the upper one larger and equaling the flowers. *Per.*

1. *A. odoratum.**Sweet-vernal Grass.*

Culm erect, slender; leaves short, pale-green; panicle spicate, oblong, with short, nearly simple branches; spikelets pubescent, green, mostly tinged with brown; palea of the lateral flowers ciliate on the margin, one with a bent awn near the base; the other with a short, straight awn below the tip. A common, early grass, very fragrant when drying; found in fields and meadows. Culm 8'—15' high. *May—June.*

30. PHÁLARIS.

Spikelets in dense panicles, with 1 perfect flower, and 2 neutral, abortive rudiments at base. Glumes 2, equal, long

than the 2, coriaceous, awnless paleæ, which inclose the compressed grain. *Per.*

1. *P. arundinæa.*

Canary Grass.

Culm tall, erect, simple or branching; leaves lanceolate, rough on the margin; panicle contracted, oblong, more or less branching; branches somewhat spicate, densely flowered, at length somewhat spreading; rudimentary flowers hairy, much shorter than the perfect ones. A tall, rank grass, 2–5 ft. high, common in wet grounds. There is a variety having broad leaves, striped with different colors, frequently cultivated in gardens under the name of Ribbon-grass. *July.*

81. *MILIMUM.*

Spikelets in loose panicles, apparently 1-flowered, owing to the nearly complete absence of a second neutral flower; the lower glume of the perfect flower is also wanting, and its place is supplied by the remaining palea of the abortive flower. Paleæ of the perfect flower 2, awnless. Grain smooth not grooved. *Per.*

1. *M. effusum.*

Millet Grass.

Culm tall, erect, simple, smooth; leaves long, flat, thin, broad-linear; panicle very large and loose, with spreading branches; spikelets ovoid, scattered. A tall grass, 2 ft. high, rather common in low woods, with pale-green foliage, and large, diffuse panicles. *June–July.*

82. *PÁSPALUM.*

Spikelets roundish, flat on the under side, convex above, in several rows, on one side of a flattened rachis, apparently 1-flowered, with only a single glume, the single palea of the lower empty flower supplying the place of the lower one. Paleæ 2. Stigma plumose, colored. *Per.*

1. *P. setaceum.*

Wild Millet.

Culm slender, decumbent or ascending, simple or branching at base; leaves linear-lanceolate, flat, ciliate, and with the sheaths softly hairy; spikes mostly solitary, very slender, terminal one on a long, very slender peduncle; lateral ones often with included peduncles; spikelets orbicular, in 2 rows, each broader than the flexuous rachis. A not uncommon weed in sandy fields near the coast. Culm 1–2 ft. long. *Aug.*

83. *PÁNICUM.*

Spikelets panicle, racemed, or somewhat spicate, consisting of 1 neutral or staminate flower, and 1 perfect flower. Glumes 2, usually minute, sometimes wanting. Lower flower with a single palea usually awnless, sometimes awned, rarely with 2 paleæ; upper flower perfect, with 2 awnless paleæ which inclose the free grain. Stigmas plumose, mostly colored.

§ Spikelets awnless, in little clusters, arranged in single, racemose, mostly 1-sided spikes. Lower flower neutral. *An.*

1. *P. sanguinale.*

Crab-Grass.

Culms decumbent at base, rooting at the joints, then erect; leaves linear-lanceolate, and with the sheath somewhat hairy; spikes 3–12, in digitate, terminal clusters; spikelets mostly in pairs, oblong, appressed to the somewhat flexuous rachis in about 2 rows; upper glume shorter than the flower. A common and very troublesome weed in gardens and cultivated grounds, where it spreads with great rapidity. Culm 1–2 ft. high, bearing a digitate cluster of a. e. r, usually purplish spikes.

2. *P. glabrum.*

Smooth Crab-Grass.

Culms procumbent or slightly ascending, mostly smooth, rarely rooting at the joints; leaves short and flat; spikes 2–5, rather alternately than digitately clustered, very slender; spikelets crowded, somewhat hairy; upper glume equalling the flower. A weed like the last, but less common, found in sandy fields, and distinguished by its almost entirely procumbent, smooth culm not rooting at the joints, and its usually alternate, filiform spikes. Culm 6'–15' long. *Aug.*

§ 2. Spikelets awnless, panicle.

3. *P. agrostoides.*

Clustered Panic-Grass.

Culm compressed, rigidly erect, often geniculate at base; leaves long, smooth, with short, smooth sheaths; panicles erect, terminal and lateral, contracted, somewhat pyramidal; branches nearly simple, densely racemose, somewhat 1-

sided; spikelets small, pedicellate, purplish; upper glume veined; lower flower neutral, with 2 paleæ. A common species in wet meadows, 2 ft. high, distinguished by its very long leaves and the racemose branches of the panicle. *Aug. Per.*

4. *P. proliferum.*

Panic-Grass.

Smooth; culm thick, succulent, geniculate, procumbent at base, then ascending; leaves linear-lanceolate; panicles large, pyramidal, terminal and lateral; branches slender, at length spreading, with small, racemose, appressed spikelets; neutral flower consisting of 1 palea, slightly longer than the perfect flower. A common species in meadows and swamps along the coast, distinguished by its succulent, geniculate culms, which are 1–2 ft. high. *Aug. An.*

5. *P. capillare.*

Hair Panic-Grass.

Culm erect, simple above, often branched at base; leaves broad-linear, hairy as well as the sheaths; panicle very large, pyramidal, very loose, with numerous capillary branches; spikelets small, on long, slender pedicels; neutral flower consisting of 1 palea, much longer than the perfect flower. A common species in cultivated grounds, distinguished by its hairy leaves and sheaths and its very large and capillary panicle. Culm 1–2 ft. high. *Aug. An.*

6. *P. virgatum.*

Wand-Grass.

Smooth; culm tall, erect, nearly simple; leaves very long, broad-linear, flat; panicle very large, diffuse, slender, with finally spreading or drooping branches; spikelets scattered, pedicellate, quite large, often purplish; lower flower staminate; stamens with purple anthers. A rather common species in sandy soils, especially near the coast. Culm 2–5 ft. high. *Aug. Per.*

7. *P. latifolium.* *Broad-leaved Panic-Grass.*

Culm erect, smooth, nearly simple, usually bearded with soft hairs at the nodes; leaves oval-lanceolate, cordate and clasping at base, nearly or quite smooth; sheaths smooth, except at the usually bearded throat; panicle loose, short, on an exerted peduncle, with short, nearly simple, spreading branches; lower flower usually staminate, with a single palea. A common species in low thickets and damp woods, sufficiently distinguished by its broad leaves with smooth sheaths, bearded at the throat. Culm 1–2 ft. high. *June–July.*

8. *P. clandestinum.*

Stiff Panic-Grass.

Culms erect, rigid, very leafy above, with short, appressed branches, smooth at the nodes; leaves oblong-lanceolate, cordate and clasping at base, tapering to a long-acuminate point; sheaths rough with dense bristles; panicles terminal and lateral, more or less inclosed in the sheaths, the terminal rarely on a long, exerted peduncle, all very loose, with spreading, racemose branches; lower flower mostly, if not always, neutral, with only 1 palea. A common species in low, wet grounds, especially along streams, distinguished from the last by its more rigid stem not bearded at the nodes, the rough-hispid sheaths and the partly included panicles. Culm 2–3 ft. high. *Aug. Per.*

9. *P. dichotomum.*

Forked Panic-Grass.

Culm slender, erect or somewhat decumbent, generally simple at first, at length usually very branching, and often somewhat dichotomous; leaves linear-lanceolate, flat; radical ones usually much shorter and broader, sometimes smooth and shining, dark green, as also the sheaths, sometimes pale green, and more or less hairy; panicles compound, terminal and lateral, usually on more or less exerted peduncles, with spreading branches; lateral panicles often short and simple, and more or less included in the sheaths; spikelets often purplish, small; lower flower neutral, with a single palea. A very common and variable species, growing in moist situations, with corresponding varieties in size, pubescence and other characters. Culm 4'–20' high, or higher. *June–Sep. Per.*

§ 3. Spikelets crowded in dense, spicate clusters, forming a dense paniculate spike. Lower palea of the lower flower awned or mucronate.

10. *P. Crús-gállí.*

Barn-yard Grass.

Culm stout, branching at base; leaves lanceolate, flat, rough on the margin, otherwise smooth, as also the sheaths; spikes alternate, compound, forming a dense panicle; lower flower neutral, with 2 paleæ; lower palea, awned; awn rough, usually long. A coarse, weedy, variable grass, very common in rich, waste grounds. The flowers are sometimes awnless, and the sheaths densely hispid, when it grows in salt-water ditches, as it often does. Culm 2–4 ft. high. *Aug.–Sep. An.*

84. *SETÁRIA.*

Spikelets in compound, cylindrical spikes, furnished with 1 or

more bristles, resembling awns; otherwise as in the *Panicum*-proper. *An.*

1. *S. glauca.**Bottle-Grass.*

Culm erect; leaves lanceolate, rough, hairy at base; spike dense, cylindrical, of a dull-yellowish color when mature; bristles in clusters of 6–10, much longer than the spikelets. A very common weed in waste places, distinguished by its bristly, cylindrical spike. Culm 1–2 ft. high. *July–Aug. An.*

35. ANDROPÖGON.

Spikelets in pairs at the joints of the rachis, spicate or racemed, one of them pedicellate, barren, often rudimentary; the other with the lower flower neutral, and consisting of a single palea; the upper perfect. Palea thin and more delicate in texture than the longer glumes; lower one awned at the tip. Stamens 1–3. *Per.*

1. *A. furcatus.**Broom-Grass.*

Culms erect, branching, nearly smooth; leaves linear-lanceolate, nearly smooth; radical ones very long; spikes straight, 3–6, hairy, digitate or clustered at the top of the culm, or else fewer and terminating the branches, usually purple; spikelets approximate, hairy, appressed; sterile spikelets staminate, awnless; stamens 3. A coarse, tall grass, 4–6 ft. high, common in dry soils, and distinguished by its digitate spikes. *Sep.*

2. *A. scoparius.**Beard-Grass.*

Culm erect, slender, very branching; branches erect, paniculate; leaves narrow, hairy, as also the sheaths; spikes slender, loosely-flowered, terminating the branches, 2–3 from each sheath, on peduncles of various lengths, usually purplish; rachis flexuous; pairs of spikelets remote; sterile spikelets neutral; lower glume awned; lower palea of the perfect flower with a twisted awn. A more slender species than the last, common in sandy soils, distinguished by its more slender branching stem, and its slender spikes on separate peduncles. Culm 2–4 ft. high.

36. SÓRHUM.

Spikelets pedicellate, in clusters of 2–3, forming an open panicle; lateral ones barren, often mere pedicels; middle spikelet fertile. Glumes coriaceous; 2 lower flowers neutral, consisting only of single palea; upper flower with 2 palea, the highest of which is awned at the tip.

1. *S. nutans.**Indian-Grass.*

Culm erect, terete, simple; leaves linear-lanceolate, glaucous, rough; panicle oblong, somewhat crowded; perfect spikelets bright reddish-brown, at length nodding, crowded toward the base with reddish hairs; awns twisted, longer than the flower; sterile spikelets small, very imperfect, often mere hairy pedicels. A coarse grass, 2–5 ft. high. Common in sandy soils. *Aug.–Sep. Per.*

2. *S. saccharatum.**Broom-Corn.*

Culm tall, erect, solid; leaves lanceolate, pubescent at base; panicle very large, diffuse; branches long, slender, whorled, at length drooping; perfect spikelets with hairy, persistent glumes. This well-known grass is extensively cultivated for its large, branching panicle, which is used in the manufacture of brooms. Culm 6–12 ft. high. *An.*

37. ZEA.

Flowers monœcious. Barren flowers in terminal, clustered racemes. Spikelets 2-flowered; glumes 2, obtuse, nearly equal; palea obtuse, awnless. Fertile flowers lateral and axillary, densely arranged on the surface of a soft, spongy, at length nearly woody, round rachis, which is inclosed in an involucre of numerous bracts. Spikelets 2-flowered, 1 flower abortive. Glumes 2, obtuse. Palea awnless. Style 1, very long, filiform, upper part pendulous from the closed apex of the involucre. Grains in 3–12, usually regular rows, compressed. *An.*

1. *Z. mays.**Indian Corn.*

Culm erect, leafy, branching only at base; leaves very long, channelled, recurved, entire, 2–4 ft. long; barren spikes 6–12, in terminal, nearly digitate clusters; fertile spikes, 1–4, nearly sessile, 6'–15' long, and even longer. A universally esteemed grain, cultivated in almost all sections of the United States, and every where in the American tropics. Culm 5–8 ft. high at the North, 10–20 ft. at the South. The grain varies from white to yellow, red, and even blue and purple. *July.*

SERIES II. Cryptogamia.

CLASS III.—ACROGENS.

ORDER CXXI. Equisetaceæ.—Scouring Rush-tribe.

1. Equisetum.

Fructification spicate. Sporangia 6–7, attached to the under surface of each peltate scale, 1-celled, opening on the inner side. Spores numerous, each furnished with 4 elastic filaments termed elaters, which are coiled spirally around it.

1. *E. limosum.**Pipes.*

Stem tall, stout, smooth, many-furrowed, at first nearly simple, at length producing simple, erect branches from above the sheaths; spikes oblong-ovoid; sheaths appressed, with short, acute, dark-brown teeth. A tall, leafless plant, 2–3 ft. high, common in wet meadows and the borders of ponds. Most of the stems bear a single, dark, terminal spike, but others are barren. All are annual and greedily eaten by cattle. *July.*

2. *E. hyemale.**Scouring Rush.*

Stems evergreen, erect, mostly entirely simple, many-furrowed, with the ridges rough; sheaths whitish, black at top and base, with subulate, quickly deciduous teeth; spike terminal. A stout, upright species, sufficiently distinguished by its very rough stem, which is often used in scouring metals, and by its sheaths. Stem 2–3 ft. high. Common in wet grounds. *June.*

3. *E. arvense.**Field Horse-tail.*

Stems fertile and sterile; fertile stems brownish, bearing the spike, erect, simple, with large, inflated sheaths, which have long, dark-brown teeth, appearing early in the spring and soon decaying, followed by the sterile stems, which are erect or decumbent at base, with numerous, long, simple, whorled, quadrangular, rough, green branches. A very common species in wet grounds. The fertile and sterile stems are remarkably different in appearance, the one being simple and brownish, and the other very branching and green. *April.*

4. *E. sylvaticum.**Wood Horse-tail.*

Stems fertile and sterile; fertile stems erect, bearing the single, pedunculate spike, with a few whorls of greenish, compound, reflexed branches, which are racemose with the numerous branchlets; sterile stems as in the fertile, except that they are later, and have numerous green branches. Distinguished from the last by its branching fertile stems, and its whorls of deflexed branches with numerous branchlets. Stem 6'–12' high. Common in wet grounds. *May*

ORDER CXLII. Filices.—Fern-family.

SYNOPSIS OF THE GENERA.

SUBORDER I. Polypodiinæ.

Fronds circinate in the bud. Sporangia in dots, or in lines or clusters on the back of the frond or its segments, pedicellate, the pedicel expanded above into a ring, surrounding the sporangia, which open transversely on the inner side. Sori mostly inclosed while young in a membranaceous covering called an *INDUSIUM*.

** *Indusium none.*

1. *POLYPODIUM.* Sori separate, never confluent, scattered on the back of the frond.

2. *STRUTHIOPTERIS.* Sori on a separate, fertile frond, which is much smaller than the sterile, crowded, and at length confluent and covering the whole under surface.

** *Indusium present.*

† Sori strictly confined to the margin.

3. *PRÆRIS.* Sori very narrowly linear, confluent, in a continuous marginal line.

4. *ADIANTUM.* Sori roundish. Indusium reniform. Frond somewhat pedately parted.

5. *DICKSONIA.* Sori roundish, with a double indusium, one opening outward and one opening inward.

6. *DEYOPTERIS.* Sori roundish, with a single, somewhat flattened, roundish-reniform indusium.

†† Sori not confined to the margin.

7. *ASPLENIUM.* Sori linear or oblong, attached lengthwise. Indusium opening lengthwise.

7. *CYSTOPTERIS*. Sori roundish. Indusium oblong-reniform, cucullate, inflated at base, attached by the inner side, and opening on the other.

8. *WOÓDSIA*. Sori globular. Indusium attached by the base all the way round, opening above at the centre.

9. *DRYOPTERIS*. Sori round. Indusium round-reniform, flattened, opening all round.

10. *POLYSTICHUM*. Sori round. Indusium orbicular, depressed and attached at the centre, opening all round.

11. *OSOCLEA*. Sori on separate, smaller fronds, inclosed in a sort of berry-like involucre, at first separate, at length confluent.

SUBORDER II. Osmundinæ.

Sporangia naked, destitute of a ring, opening by a longitudinal slit. Frond circinate in the bud.

12. *OSMÚDA*. Sori large, subglobose, pedicellate.

SUBORDER III. Ophioglossæ.

Sporangia 1-celled, opening by a transverse slit, destitute of a ring. Frond not circinate in the bud.

13. *BORRICHUM*. Sporangia in a racemose panicle, distinct.

1. POLYPODIUM.

Sori roundish, irregularly scattered on the under surface of the frond. Indusium none.

1. *P. vulgare*.

Polypod.

Frond oblong in outline, deeply pinnatifid; segments oblong, obtuse, obscurely crenate, green on both sides; stipe smooth, naked; sori large, roundish. A common evergreen fern in woods, where its creeping, scaly rhizomas form large patches, distinguished by the oblong, simply pinnatifid fronds and nearly entire, oblong segments. Frond 6'—18' high. *July*.

2. *P. Phegopteris*.

Triangular Polypod.

Frond annual, twice pinnatifid, triangular in outline, longer than broad, hairy on the veins; pinnæ lanceolate; 2 lower ones deflexed; the ultimate segments oblong-linear, entire; sori minute. An elegant fern, distinguished by its triangular outline, and the deflexed lower pair of pinnæ, which make it appear somewhat hastate. Rhizoma blackish. Frond 6'—12' high. Rather common in rich, rocky woods, especially towards the North. *July*.

3. *P. Dryopteris*.

Ternate Polypod.

Stipe very slender, smooth, brittle; frond ternate, divisions twice pinnate, spreading, deflexed, light green, very thin and delicate in texture; ultimate segments oblong, obtuse, somewhat crenate; sori on the margin; rhizoma filiform, creeping. An exceedingly delicate and beautiful fern, growing in the shade of rocky, and especially mountainous woods. Frond 4'—8' high. *July*.

2. STRUTHIÓPTERIS.

Sori on separate, smaller fronds, at length covering the entire lower surface, arranged on the pinnate, unconnected veins, destitute of an indusium.

1. *S. Germánica*.

Ostrich Fern.

Sterile fronds tall, with stout, smooth, channelled stipes, pinnate; pinnæ sessile, pinnatifid; ultimate segments entire; fertile fronds much smaller, with numerous, contracted, brownish segments covered with sori. A very large and showy fern, not uncommon in low, rich woods, growing in clumps. The fertile fronds are about a foot high, the sterile fronds 3—4 ft., and even higher. *Aug*.

3. *PTERIS*.

Sori linear, very narrow, confluent in a continuous, marginal line. Indusium continuous, attached by the margin.

1. *P. aquilina*.

Brake.

Stipe erect, stout, bearing the ternate frond at summit; divisions bipinnate, very spreading; ultimate segments oblong-lanceolate; upper segments entire; lower somewhat pinnatifid, with obtuse, oblong lobes. A tall stout fern, triangular in outline, with a dull green frond, and usually purple stipe. Very common in pastures, fields and thickets. The continuous indusium forms a margin to all the segments of the frond, which, together with the stipe, is 2 ft. high. *Aug*.

4. ADIANTUM.

Sori roundish, marginal on the lobes of the frond. Indusium reniform, appearing like a reflexed margin of the frond, and bearing the sporangia on its under surface.

1. *A. pedatum*.

Maiden-hair.

Stipe erect, slender, black, bearing a 2-parted frond at top, each division consisting of several slender segments branching from one side, and bearing numerous, oblong-rhomboid segments, which are oblique, petiolate, entire on the margin next the rachis, inclosed out at the other margin, appearing as if valved, and of a glaucous green. A very elegant and graceful fern, distinguished by the black, polished stipe and branches, and delicate foliage, 8'—15' high. *July*.

5. ASPLENIUM.

Sori linear or oblong, oblique, scattered, attached lengthwise. Indusium opening lengthwise in the direction of the mid-vein.

1. *A. ebëneum*.

Ebony Spleenwort.

Frond on a short, smooth stipe, erect, linear-lanceolate in outline, pinnate; pinnæ lanceolate-oblong, somewhat falcate, serrate, sessile, auriculate at base on the upper side; sori numerous, in short lines on both sides of the mid-rib. A slender, elegant fern, with a smooth purple stalk, growing 6'—15' high. Common in rocky woods. *Aug*.

2. *A. Trichómanes*.

Dwarf Spleenwort.

Fronds tufted, linear in outline, pinnate; pinnæ small, roundish-elliptical, nearly sessile, oblique and entire at base, crenate above. A delicate little fern, common in tufts on shaded rocks, 8'—7' high, with very slender, purple stalks. *July*.

3. *A. thelipteróides*.

Silvery Spleenwort.

Frond with a chaffy stipe, pinnate; pinnæ deeply pinnatifid, linear-lanceolate; ultimate segments oblong, obtuse, with 2 rows of shining, silvery sori, which, when young, are covered with shining, silvery indusia. A handsome fern of a pale green color, not uncommon in low, shaded grounds. It is distinguished before maturity by the shining silvery hue of the indusia. Frond 1—3 ft. high. *July*.

4. *A. Filix-femina*.

Common Spleenwort.

Frond oblong, or oblong-lanceolate in outline, bipinnate, entirely smooth; pinnæ lanceolate, acuminate; segments oblong-lanceolate, pinnatifidly cut and toothed; sori large, oblong, numerous, finally confluent over the whole under surface of the frond, and giving it a dark-brown color. Very common in moist fields and woods. Frond 2—3 ft. high. *July*.

6. DICKSONIA.

Sori roundish, marginal, distinct. Indusium double; one consisting of a recurved, 2 lipped, little sac, that opens outward, and is attached by its edges to the proper indusium, which is marginal and opening inward.

1. *D. punctilóbula*.

Gossamer Fern.

Frond slightly hairy, ovate-lanceolate in outline, pinnate; pinnæ deeply twice pinnatifid; ultimate segments cut and toothed; sori minute. A very delicate and beautiful fern, remarkable for the numerous and very fine divisions of its pale-green frond, 2—3 ft. high. *July*.

7. CYSTOPTERIS.

Sori roundish. Indusium oblong-reniform, cucullate, inflated at base, attached by the inner side, and opening on the other.

1. *C. fragilis*.

Bladder Fern.

Frond oblong-lanceolate in outline, bi- or tri-pinnate; ultimate segments oblong or oblong-ovate, more or less pinnatifid and toothed; rachis winged by the decurrent segments. A slender and variable species, common on moist, shaded rocks. *July*.

8. WOÓDSIA.

Sori globular. Indusium thin, attached by the base all the way round, open above, at the centre, with a variously cut and fringed margin.

1. *W. obtusa*.

Hairy Wood Fern.

Frond ovate-lanceolate in outline, very slightly hairy; pinnæ ovate or oblong, very broad at base so as to be somewhat triangular, almost pinnate again; ultimate segments oblong, rounded at apex, pinnatifidly divided into lobes, each of which bears a single fruit-dot. A little fern 6'—8' high, growing in tufts on rocks. The stipe is slightly chaffy.

2. *W. ilvénis*.*Woolly Fern.*

Frond oblong-lanceolate in outline, smoothish and light-green above, covered with a reddish wool beneath, as also the stipe; pinnae oblong, almost pinnate; ultimate segments crenately and minutely toothed; sori attached near the margin, at length almost confluent. A little fern, 4'—6' high, distinguished by the hairy under surface of the frond. Common on rocks. *June.*

9. DRYOPTERIS.

Sori round. Indusium somewhat flattened, roundish-reniform, opening all round.

1. *D. Thelypteris*.

Frond oblong-lanceolate in outline, pinnate, tapering in width from base to apex; pinnae linear-lanceolate, deeply pinnatifid; ultimate segments oblong, obtuse, nearly entire, revolute on the margin; sori crowded, at length confluent. A common fern in low grounds and swamps. Frond 10'—18' high. *July—Aug.*

2. *D. Noveboracensis*.

Frond oblong-lanceolate in outline, pinnate, tapering in width to the apex, except near the base, where the lower pairs become shorter than those above and are bent down; pinnae linear-lanceolate, deeply pinnatifid; ultimate segments oblong, obtuse, nearly entire, not revolute at the margin. Sori scattered, marginal, not at any time confluent. A common species in wet grounds, much resembling the last, but of a paler green, and with the texture of the foliage somewhat more delicate. Frond 10'—18' high. *July—Aug.*

3. *D. intermedia*.*Shield Fern.*

Frond oblong-ovate in outline, bipinnate, of a rather dark, shining green; segments narrow-oblong, obtuse; lower ones deeply pinnatifid, with sharply toothed lobes; upper ones pinnatifidly cut, with more or less toothed lobes; serrate teeth of the ultimate segments tipped with soft, short bristles. Sori sparsely scattered. A very common species in woods, 1—2 ft. high. *July.*

4. *D. cristata*.*Crested Shield-Fern.*

Frond narrow-oblong in outline, pinnate; pinnae short, ovate or oblong, very broad at base, so as to appear somewhat triangular, acute, usually alternate, deeply pinnatifid; lowest segments oblong, obtuse, nearly pinnatifid, the others finely serrate, or toothed; sori large, in a single row, between the mid-vein and the margin often confluent. A rather common species in swamps and low grounds, distinguished by its long, narrow, dark-green fronds, which are 1—2 ft. high, with a scaly stipe. *July.*

5. *D. marginale*.*Marginal Shield-Fern.*

Frond oblong-ovate in outline, bipinnate; pinnae lanceolate, broad at base; ultimate segments oblong, obtuse, more or less crenately toothed; upper ones decurrent; sori large, arranged entirely on the margin. A large, elegant fern, common in moist, rocky woods, 10'—15' high; distinguished by its entirely marginal sori.

10. POLYSTICHUM.

Sori round. Indusium orbicular, peltate, depressed, attached to the centre, opening all round.

1. *P. acrostichoides*.*Chaffy Shield-Fern.*

Frond lanceolate in outline, on a chaffy stipe, pinnate; pinnae nearly or quite alternate, distinct, lanceolate, and somewhat falcate, on short stalks, serrate, rarely cut and lobed, teeth tipped with bristles; upper one smaller, and bearing the sori near the mid-rib, which at first merely contiguous, soon become confluent, and cover the surface. A very common fern, with dark, evergreen foliage, growing 1—2 ft. high, in woods. *July.*

11. ONOCLÉA.

Fronds fertile and sterile. Fertile frond bipinnate; alternate segments very strongly revolute, forming a sort of berry-shaped involucre, containing the sporangia. Sori at first separate, at length confluent. Indusium thin, cucullate, attached by the lower side.

1. *O. sensibilis*.*Sensitive Fern.*

Sterile fronds in clumps, on long, smooth stipes, broad-triangular in outline, deeply pinnatifid, almost pinnate; segments oblong-lanceolate, entire or undulate and toothed, varying to pinnatifid; upper segments passing into each

other. A very common fern in low grounds, especially the sterile fronds, with a remarkable difference between the sterile and the smaller, fertile fronds; 10'—18' high. *July.*

12. OSMÚNDA.

Sporangia globose, pedicellate, naked, opening with 2 valves, entirely covering the surface of the much contracted fertile fronds, or fertile pinnae.

1. *O. spectabilis*.*Flowering Fern.*

Stipe smooth; frond bipinnate, entirely smooth, bearing the fruit in a terminal, contracted, racemose panicle; ultimate segments oblong-lanceolate, distinct, serrate, rather oblique at base. An elegant fern, 2—3 ft. high, distinguished by the terminal, reddish-brown, bipinnate panicle, formed of the contracted segments of the frond. Common in swamps and low grounds. *June.*

2. *O. cinnamomea*.*Cinnamon Fern.*

Sterile and fertile fronds separate, appearing at the same time, each clothed with long, rusty wool; sterile fronds at length smooth, pinnate; pinnae lanceolate, pinnatifid; ultimate segments broad, ovate-oblong, obtuse, entire; fertile fronds bipinnate, much contracted, nearly or quite covered with the reddish sporangia. A very common fern growing in clumps in low grounds and swamps. The fertile fronds soon decay, but the barren fronds continue to grow, attaining the height of 3—6 ft. *May—June.*

3. *O. Claytoniana*.*Interrupted Fern.*

Fronds at first woolly, especially at base, soon smooth, pinnate; pinnae oblong-lanceolate, deeply pinnatifid, except a few which are near the middle, and when full grown are completely pinnate and fertile, covered with reddish-brown sporangia; ultimate segments of the sterile pinnae oblong, obtuse. A very common fern in low grounds, 2—6 ft. high, distinguished by its middle, fertile pinnae between sterile ones at base and summit. *May—June.*

13. BOTRYCHIUM.

Frond consisting of 2 portions, a terminal, pinnately-parted, contracted, racemose, fertile segment, and a lateral, sterile segment. Sporangia sessile, distinct, clustered, opening by 2 transverse valves.

1. *B. Virginicum*.*Rattlesnake Fern.*

Plant somewhat hairy; sterile frond situated above the middle, ternately divided completely to the sessile base, triangular in outline; primary divisions pinnate; pinnae pinnately divided; ultimate segments oblong-lanceolate, pinnatifidly cut and toothed; fertile frond bipinnate, forming a contracted, racemose, pedunculate panicle. A beautiful fern, common in rich, rocky woods, 1—2 ft. high. *July.*

ORDER CXLIII. Lycopodiaceæ.—Club-moss-family.

1. LYCOPODIUM.

Sporangia compressed, mostly reniform, 1-celled, opening by 2 transverse valves, axillary, usually in a kind of spike consisting of reduced leaves or bracts, with the sporangia in their axils, or sometimes contained in the axils of the proper leaves.

* *Sporangia in the axils of the proper leaves.*

1. *L. lucidulum*.*Shining Club-moss.*

Stems thick, simple or dichotomous, with a few ascending branches; leaves dark green, in about 8 rows, more or less spreading or recurved, linear-lanceolate, acute; stem 4'—8' high, thickly clothed with the rigid, dark green leaves, which are larger than in the other species. Common in low rich woods. *Aug.*

** *Sporangia in distinct spikes*

2. *L. dendroideum*.*Tree Club-moss.*

Stem erect, simple below, with the linear-lanceolate, short and erect, appressed leaves in 4 rows, dividing above into many, nearly or quite erect, cylindrical branches; spikes 1—3, cylindrical, sessile, the branches being leafy to the top. A handsome little tree-like evergreen, arising from a creeping rhizoma. Common in moist woods. Stem 6'—8' high. *Aug.*

3. *L. obscurum*.*Spreading Club-moss.*

Stem erect, clothed by the linear-lanceolate leaves in 4—6 unequal rows; branches spreading, flat, the leaves on the upper side being shorter and appressed; spikes 1—3, sessile, cylindrical. A common species in damp woods, distinguished from the last, which it much resembles, by the spreading, almost horizontal, flat branches. Stem 6'—8' high. *Aug.*

4. *L. clavatum*.*Ground Ivy.*

Stems creeping, with short, ascending, densely leafy branches; leaves linear-subulate, mucronate, spreading, curved upward; spikes 2—3, apparently pedunculate; the leaves on the very slender foot-stalk being minute and inconspicuous. A common trailing evergreen, found in dry woods, distinguished by its long, creeping stem, and short, ascending, densely leafy branches. *July.*

5. *L. complanatum*.*Ground Pine.*

Stem creeping; branches erect, ascending, compressed, dichotomous; branchlets numerous, spreading, almost horizontal, compressed; leaves minute,

appressed, subulate, in 4 unequal rows, united by their decurrent base; marginal row with slightly spreading tips; the other rows entirely appressed; spikes 2—6, cylindric, pedunculate. A trailing evergreen, frequent in moist woods, where it forms large beds. *July.*

2. SELAGINÉLLA.

Sporangia of 2 kinds, the first are very minute, 1-celled, and opening by 2 transverse valves; the other kind larger, 3—6-valved, and containing much larger spores. These 2 kinds are either found in the same axils, or the larger are separate, in the lower axils.

1. *S. rupestris*.*Rock Club-moss.*

Stem creeping, with many tufted branches; branches ascending, densely clothed with the scattered, linear-lanceolate, imbricated, appressed, grayish, mucronate leaves; spike leafy, 4-angled, with both kinds of sporangia in the same axils. A grayish, moss-like plant, on rocks, of a somewhat stunted, dried up appearance. Stems 2'—3' long. *July.*

GLOSSARY.

A in composition has the force of *not*, or *without*, as *apetalous*, *without petals*.
 Abortion; 860.
 Abortive; wanting by abortion.
 Acaulescent; destitute of a caulis, (220) or proper stem.
 Accent; the grave accent, thus (`), denotes that the vowel over which it is placed is long; the acute accent, thus ('), denotes that the vowel is short.
 Acetose; 275, at (15).
 Achenium; 481.
 Achlamydeous; destitute of both calyx and corolla.
 Acotyledonous; 121.
 Aculeate; prickly.
 Acuminate; 234, at (3).
 Acute; 284, at (1).
 Adherent; 383, at (2).
 Adnate; 292, at (1); 363; form of the anther, 423, at (2).
 Aerial-roots; 152.
 Aggregate; densely clustered.
 Albumen; 63; 501.
 Albumin; 201.
 Alternate; 260, at (1).
 Alveolate; presenting the appearance of a honeycomb.
 Ament; 342.
 Anceps; flattened, so as to appear 2-edged.
 Androecium; 434.
 Androgynous; having staminate and pistillate flowers in the same clusters.
 Annual; abbreviated *An.*, 144.
 Anterior; that part or side of any organ which is furthest from the main axis is said to be anterior.
 Anther; 416.
 Apetalous; without petals.
 Appressed; pressed down closely upon something else.
 Aquatic; 151.
 Arborescent; attaining the size of a tree.
 Aril; 503.
 Armed; furnished with thorns, prickles, or some such appendage.
 Arrow-form; 275, at (1).
 Articulation; 277.
 Ascending; 237, at (1).
 Assurgent; same as ascending.
 Auriculate—Anricled; 276, at (18).
 Awn; 335.
 Awned; furnished with an awn.
 Axil; the angle between a leaf or its petiole and the branch or stem on which it grows.
 Axillary; growing in an axil.
 Axis; 112.
 Baccate; berry-like.
 Bark; 213.
 Banner; 372; 408.
 Barbed; furnished with stiff, hooked hairs.
 Barren; 372.
 Beak; a stiff terminal point.
 Bearded; furnished with long, tufted hairs.
 Berry; 477.
 Biennial; abbreviated *Bien.*
 Bifid; two-lobed or two-parted.
 Bilabiate; two-lipped; in application equivalent to Labiate; 396.
 Bipinnate; 279, at (5).
 Bipinnatifid; twice pinnatifid, as when the segments of a pinnatifid leaf, 275 at (20) are again pinnatifid.
 Biternate; 251, at (1).
 Bracted—Bracteate; furnished with bracts.
 Bracteoles; 350; 384.

Bracts; 296.
 Branches; 175.
 Branchlets; subdivisions of the branches.
 Bristles; 81, at (1).
 Bud; 172.
 Bulb; 241.
 Bulblet; 242.
 Bulbiferous; bulb-bearing.
 Caduceous; 411, at (1).
 Caespitose; growing in tufts.
 Calyptra; 99.
 Calyx; 381.
 Cambium; 44.
 Cambium Layer; 202.
 Campanulate; 394.
 Canescent; clothed with a silvery-white pubescence.
 Capillary; very slender—as fine as hairs.
 Capitule; clustered in heads; 345.
 Capsule; 471.
 Carinate; shaped like the keel of a ship.
 Carpel; 455.
 Carpellary; 458.
 Carpophore; Order LVII., page 114.
 Caryophyllaceous; 401.
 Caryopsis; 434.
 Catkin; 342.
 Caudate; tipped with a tail-like appendage.
 Caulescent; possessing a caulis (226), or proper stem.
 Caulescent; belonging to the caulis (226), or stem.
 Cells—of the ovary, 455—of the anther, 422.
 Cell-growth; 83.
 Cellular; 26.
 Cellular tissue; 29.
 Centrifugal—Inflorescence; 384.
 Centripetal; 334.
 Chaffy; clothed with chaff-like scales.
 Channelled; deeply furrowed or grooved.
 Ciliate; 81.
 Circinate; 258, at (6).
 Circumscissile; opening all round, as in the pyxis, 437.
 Clirrhose; 279, at (4).
 Claspings; 275, at (14); 285, at (4).
 Clavate; club-shaped; enlarged upward toward the apex.
 Claw; 398, at (2).
 Cleft; same as lobed, 276.
 Colored; not green.
 Column; Order CXXV., page 126.
 Coma; a tuft of silky hairs attached to a seed; 497.
 Comose; furnished with such a tuft.
 Commissure; 432.
 Complete—flower; 354; 370.
 Compound leaf; 277.
 " " pistil; 413; 454.
 Compressed; flattened.
 Concave; hollowed out.
 Conduplicate; 258, at (1).
 Cone; 491.
 Confluent; growing together.
 Conical—root; 139.
 Connate; 275, at (17).
 Connective; 422.
 Connivent; converging toward each other.
 Continuous; uninterrupted; without joints or divisions.
 Contracted; drawn together; scarcely spreading, as a panicle with appressed branches is contracted.
 Convex; swelling outward.
 Convolute; 373.
 Cordate; 275, at (7).
 Coriaceous; thick; leathery.
 Corm; 248.

Corolla; 351; 393.
 Corymb; 383.
 Corymbose; arranged in a corymb.
 Cotyledon; 117.
 Creeping—stem; 245.
 Crenate; 283, at (5).
 Crest; a ridge-like process somewhat resembling the crest of a helmet.
 Crown; an appendage of the disk, as in the thin cup-like expansion of the Narcissus.
 Cruciform; 400.
 Cryptogamous; 103.
 Cucullate; hooded; resembling a hood.
 Culm; 223.
 Cuneiform, or cuneate; like a wedge.
 Cut; 283, at (7).
 Cylindric; shaped like a cylinder.
 Cyme; 347.
 Cymose; arranged in a cyme.
 Dash (—) between two numbers signifies that any number between those given including the numbers themselves will be correct, as stamens 1—3, which is thus expressed, stamens from 1 to 3; that is either 1, 2, or 3.
 Decandrous; 435.
 Deceiduous; 315, at (1); 411, at (2).
 Declinate and declined; bent downward.
 Decomound; 232.
 Decumbent; 237, at (2).
 Decurrent—leaf; 275, at (28).
 Decussate; crossing at right angles.
 Definite; few in number and not subject to variation.
 Deflexed; bent downward.
 Dehiscence—of the anther, 422; of the fruit, 467.
 Deltoid; shaped like the Greek letter Δ.
 Dentate; 283, at (3).
 Depressed; pressed down.
 Diadelphous; 437.
 Dichotomous; regularly forked; 132.
 Dicotyledonous; 119.
 Diliculous; flowers not perfect; 374.
 Didymous; composed of 2 equal, separable carpels, as in Umbellifera.
 Didynamous; 436, at (1).
 Diffuse; widely-spreading.
 Digitate; 290.
 Dioecious; 437.
 Discoid; 407, at (1).
 Disk; 345, 354; also in the radiate Composite; 407, at (2).
 Dissected; 283, at (8).
 Dissepiment; 455.
 Distinct; not united.
 Divaricate; widely diverging or separating from one another.
 Divided; same as lobed and lobes, 276.
 Dorsal—suture; 453.
 Downy; same as pubescent; 81, at (3).
 Drupaceous; drupe-like.
 Drupe; 430.
 Ducts; 43.
 Echinate; covered with minute prickles.
 Elaters; 97.
 Elliptical; shaped like an ellipse; nearly the same as oval, 275, at (5), but often narrower and acute at the ends.
 Emarginate; 283, at (6).
 Embryo; 502.
 Emerged; out of water.
 Endocarp; 466.
 Endosmose; 167.
 Ensiform; 275, at (27).
 Entire; 283, at (1).
 Epicarp; 466.
 Epidermis; 77—of leaves, 254.
 Epigynous; situated on the ovary.

Epiphytes; 159.
 Equitant; 259, at (3).
 Erose; 283, at (11).
 Exosmose; 165.
 Exotic; not native; of foreign origin.
 Exsert; projecting out of the flower or other envelope.
 Exstipulate; 294.
 Extrorse; 424.
 Falcate; curved like a cutlass blade.
 Farinaceous; having the consistence of grains of meal.
 Fascicle; 343.
 Fascicled—root; 142.
 Fastigate; flat-topped, as in corymbs.
 Feather-veined; 271.
 Fertile; 373.
 Fibrils; 127.
 Fibrous—root; 135.
 Filament; 418.
 Filiform; very slender; thread-form.
 Fimbriate; fringed.
 Fistular, or fistulous; hollow.
 Fleishy; having nearly the consistence of flesh.
 Flexuous; zig-zag.
 Floral envelopes; 351.
 Florets; 407.
 Flower; 351.
 Flowering plants; 103.
 Flowerless plants; 103.
 Follaceous; leafy; leaf-like.
 Follicle; 476.
 Forked; separating into 2 diverging branches; 132.
 Free; 383, at (1).
 Free central placentas; 462.
 Frilled; 283, at (9).
 Fringed; bordered by a fringe.
 Frond; 98; a leaf-like expansion, as in figs. 8 and 15, Plate III.
 Fruit; 465; 466.
 Fugacious; 315, at (2).
 Funiculus; 500.
 Funnel-form; 395.
 Furcate; somewhat forked.
 Fusiform; 137.
 Genus; plural genera.
 Germ; old name for ovary.
 Germination; 122.
 Gibbous; 357.
 Glabrous; destitute of hairs, glands and prickles; smooth.
 Glands; 82.
 Glandular; 82.
 Glaucons; of a pale sea-green color.
 Globose; shaped like a ball or globe.
 Glumaceous; composed of glumes; 255.
 Glume; 385.
 Granular; made up of little grains, resembling grains of sand.
 Grain; same as caryopsis; 434.
 Gynocelum; 444.
 Hair; 80.
 Hair-form; 275, at (12).
 Hastate; 275, at (12).
 Head; 345.
 Heart-shaped; 275, at (7).
 Heart-wood; 201.
 Herbaceous; 143.
 Herb; 216.
 Hilum; 500.
 Hirsute; 81, at (2).
 Hispid; 81, at (1).
 Hoary; clothed with short white hairs.
 Hooded; shaped like a hood.
 Hypocateriform; 392.
 Hypogynous; inserted below the ovary, usually on the receptacle.
 Imbricate; parts overlapping one another like shingles on a roof.
 Imbricated—perforation; 259, at (4); 377.
 Incised; 288, at (7).

- Indefinite; numerous and variable in number.
- Indehiscent; never opening till germination; 467.
- Induplicate; same as valvular, 379, except the edges are rolled in.
- Indusium; Order CXLI., page 131.
- Inflated; blown up like a bladder.
- Inflexed; inflexed; bent inward.
- Inflorescence; 329.
- Infundibuliform; 395.
- Innate; 423, at (1).
- Inserted; attached.
- Integument; 496.
- Internode; 177.
- Introrse; 424.
- Involucel; 387.
- Involucro; 387.
- Involucre; 253, at (4).
- Irregular; 366; 405.
- Jointed; with joints or articulations, 277.
- Keel; 403.
- Keeled; shaped like the keel of a ship.
- Kidney-form; 375, at (8).
- Labiata; 396.
- Laciniate; 233, at (6).
- Lamina; 398, at (1).
- Lanceolate; 275, at (9).
- Lateral; belonging to the side, thus—lateral leaflets, side leaflets.
- Leaf; 249.
- Leaflet; 278.
- Legume; 475.
- Lenticular; shaped like a lens.
- Liber; 204.
- Ligulate; 407, at (2) and (3).
- Ligule; 292, at (5).
- Liliaceous; 404.
- Limb; 390, at (3).
- Linear; 275.
- Lips; the two parts of a labiate flower; 296.
- Lober; 376.
- Lobed; 276.
- Loculicidal; 467, at (2).
- Loment; 475.
- Longitudinal; 44.
- Lunate; crescent-form.
- Lyrate; 275, at (19).
- Marescent; withering.
- Medullary rays; 198.
- “ Sheath; 46; 197.
- Membranous; of the texture of animal membrane.
- Mid-rib, or Mid-vein; 263.
- Monadelphous; 437.
- Moultiform; same as Granulated; 136.
- Monocotyledonous; 119.
- Monocous; 437.
- Monopetalous; 389.
- Monosepalous; 382.
- Mucronate; 284, at (4).
- Naked; not covered. Naked seeds; not inclosed in a pericarp.
- Napiform; 138.
- Nectariferous; honey-bearing.
- Nerves; nerved; same as veins, veined; 264.
- Net-veined; 269.
- Node; 176.
- Nucleus; 490.
- Nut; 435.
- Obcordate; inversely cordate; 275, at (7).
- Oblique; 228, at (26).
- Oblong; 275, at (4).
- Obovate; 278, at (3).
- Obsolete; wanting; as it were, worn out.
- Obtuse; 284, at (2).
- Obvolvate; 259, at (1).
- Ochrea; 292, at (2).
- Offset; 232.
- Opaque; of a dark, dull appearance.
- Opposite; 260, at (2).
- Orbicular; 275, at (1).
- Oval; 275, at (5).
- Ovary; 440.
- Ovate; 275, at (2).
- Ovoid; shape of a whole egg; as an ovoid FRUIT; thus differing from ovate, which refers to the superficial plane of an egg out through the middle, as an ovate LEAF.
- Ovule; 440.
- Palae; 385.
- Palmate; 275, at (24).
- Panicle; 339.
- Paniculate; arranged in a panicle.
- Papilionaceous; 403.
- Pappus; 336.
- Parastich; 154; 157.
- Parallel-veined; 272.
- Parenchyma; 34, at (3).
- Parietal; 462.
- Parted; same as lobed, or divided; 276.
- Partitions; same as *dissepiments*; 455.
- Pectinate; pinnatifid with numerous entire, slender teeth, like those of a comb.
- Pedate; 275, at (23).
- Pedice; 331.
- Peduncle; 330.
- Peltate; 275, at (25).
- Pendulous; hanging downward.
- Pepo; 473.
- Perennial; abbreviated Per.; 147.
- Perfect-flower; 374.
- Perfoliate; 275, at (16).
- Perianth; 351.
- Pericarp; 466.
- Perigynous; inserted around the ovary, usually on the calyx.
- Persistent; 315, at (3); 411, at (2).
- Personate; 396, at (1).
- Petal; 351.
- Petaloid; resembling a petal.
- Petiole; 255.
- Petiolula; 278.
- Phænogamons; 103.
- Pilose; clothed with soft, slender hairs.
- Pinnæ; the leaflets of a pinnate leaf or frond are sometimes so called.
- Pinnate; 279.
- Pinnatifid; 275, at (20).
- Pistillate; Pistil; 353.
- Pith; 196.
- Pitted; with pits or depressions.
- Placenta; 459.
- Platid; 253, at (5).
- Plumose; 116.
- Pod; 473, 474, 475.
- Pollen; 416; 419.
- Polyandrous; 435.
- Polygamous; 375; 437.
- Polyptalous; 389.
- Pome; 479.
- Posterior; that part or side of an organ nearest the main axis.
- Prefloration; 376.
- Prefoliation; 357.
- Premorse; 141.
- Prickles; 34; 137.
- Prismatic; regularly angled like a prism.
- Process; any projection from a surface.
- Procumbent; 237, at (3).
- Prostrate; 237, at (4).
- Pubescence; 81.
- Pubescent; 81, at (3).
- Pulp; the fleshy or juicy portion of a fruit.
- Punctate; dotted.
- Pyramidal; having the shape of a pyramid.
- Pyriform; pear-shaped.
- Pyxis; 487.
- Quinate; having 5 leaflets digitately, 280, arranged.
- Raceme; 337.
- Racemose; arranged in racemes.
- Rachis; 331.
- Radiate; 407, at (2).
- Radiate-veined; 270.
- Radiant; 407, at (3).
- Radical; belonging to, or growing at, the root.
- Raffole; 115.
- Ray, or Ray-flowers; the border of ligulate florets in the radiate composite; 407, at (3).
- Receptacle; the extremity of the axis in the flower.
- Recurved; curved backwards.
- Reflexed; bent backwards.
- Regular; 370; 405.
- Reniform; 375, at (3).
- Repand; 353, at (4).
- Reapinate; appearing as if inverted.
- Redentate; 260.
- Retorse; backwards.
- Retuse; 234, at (5).
- Revolvate; 253, at (3).
- Rhizoma; 244.
- Rhomboid; 275, at (6).
- Rib; a ridge or elevated line.
- Ribs of the leaves; 267.
- Ringent; 396, at (2).
- Root; 126.
- Rootstock; same as rhizoma; 244.
- Rosaceous; 402.
- Rostrate; beaked.
- Rotate; 393.
- Rough; 31, at (4).
- Rugose; with an uneven, wrinkled surface.
- Runcinate; 275, at (2).
- Runner; 231.
- Running; 231.
- Saccate; furnished with a bag or sac.
- Sagittate; 275, at (11).
- Salver-form; 392.
- Samara; 436.
- Sap; 54.
- Sapwood; 201.
- Scabrous; rough.
- Scales; small, dry bracts, as in the composita, and in aments, &c.
- Scap; 229; 332.
- Scarious; dry and colorless, resembling a thin membrane.
- Scattered; irregularly placed.
- Secund; one-sided; turned to one side.
- Seed; 107; 494.
- Seed-leaves; 117.
- Segments; same as lobes; 276.
- Semi in composition has the force of half, *a. g.*, semi-cylindrical, *i. e.*, half-cylindrical.
- Sepals; 351; 381.
- Septicidal; 467, at (1).
- Septifragal; 467, at (2).
- Serrate; 232, at (2).
- Serrulate; serrate with very fine serratures.
- Sessile leaves; 285, at (6).
- “ flowers; 330.
- “ anthers; 421.
- Setaceous; bristle-form.
- Scotose; clothed with slender bristles.
- Sheathing; 285, at (3).
- Sheath; that part of a sheathing petiole which incloses the stem.
- Shrub; 214.
- Silicle; 474.
- Siliqua; 473.
- Silky; appearing like silk.
- Simple; composed of a single piece.
- Simple leaves; 275.
- Sinuate; 275, at (18).
- Sinus; the space between the lobes of a leaf or other organ.
- Smooth; same as glabrous.
- Sori; sporangia of the ferns.
- Spadix; 296; 343.
- Spathaceous; spathe-like.
- Spathe; 343; 357.
- Spatulate; 275, at (10).
- Species; page 101.
- Spicate; arranged in spikes, or spike-like.
- Spike; 336.
- Spindle-shaped; same as fusiform; 137.
- Spinescent; 233, at (10); 192, at (4).
- Spinose; armed with spines.
- Spine; same as thorn; 136.
- Sporangium, Spore-case; 97.
- Spore; 90; 97; 107.
- Spur; a tubular prolongation of some floral organ.
- Squamulæ; Order CXL., page 129.
- Stamens; 352.
- Staminate; same as barren; 372.
- Stellate; arranged like the rays of a star, thus (*).
- Stem; 190; 191.
- Stemless; same as acanthescent.
- Sterile; same as barren; 372.
- Stigma; 442.
- Stigmatose, or Stigmatic; of or belonging to the stigma; performing the office of the stigma.
- Stings; 33.
- Stipes; 92. Also a pedicel supporting the ovary.
- Stipitate; furnished with stipels; 294.
- Stipitate; raised on a stipe.
- Stipulate; 285, at (1); 294.
- Stipule; 291.
- Stolon; 233.
- Stoloniferous; 233.
- Stomata; 79; 255; 256.
- Straight-veined; with veins running directly from the mid-vein to the margin.
- Striate; marked with lines.
- Strobile; 491.
- Style; 441.
- Sub in composition has the force of somewhat.
- Submersed; under water.
- Suborder; page 108.
- Subulate; awl-shaped, *i. e.*, very narrowly linear, tapering from a rather broad base to a very fine point.
- Succulent; juicy.
- Sucker; 230.
- Suffrutescent; somewhat shrubby.
- Sulcate; furrowed or grooved.
- Suppression; 361.
- Supra-axillary; growing out above the axil.
- Suture; 453.
- Symmetrical flower; 369.
- Tendrils; 183.
- Terete; cylindrical.
- Terminal; at the extremity of the stem or branches.
- Ternate; 281.
- Testa; 497.
- Thallus; 94.
- Theca; same as sporangium.
- Thorn; 136.
- Throat; 390, at (3).
- Thyrse; 340.
- Tomentose; 81, at (6).
- Toothed; same as dentate; 233, at (3).
- Torus; same as disk; 345; 354.
- Trailing; running at random over the ground.
- Transverse; 44.
- Tree; 213.
- Triinnate; 279, at (6).
- Tricretous; 3-angled.
- Tricretate; 231, at (2).
- Truncate; 234, at (7).
- Trunk; 227.
- Tube of the corolla; 390, at (7).
- Tuber; 240.
- Tuberous root; 140.
- Tubular; 397.
- Turbinate; top-shaped; inversely conical.
- Turgid; swelling.
- Twining; 235.
- Twisted pterofloration; same as convolute; 378.
- Umbel; 344.
- Umbellet; one of the smaller umbels which compose a compound umbel, 344.
- Unarmed; not furnished with thorns, prickles, or stings.
- Undulate; wavy.
- Unguiculate; furnished with a claw; 398, at (2).
- Unilateral; one-sided.
- Unsymmetrical; not symmetrical; 369.
- Ureolate; urn-shaped.
- Utricle; a small, dry, indehiscent 1-seeded pericarp, with thin and membranous walls, more or less inflated, and the seed loose within.
- Valvate, or Valvular; 379.
- Valves; 472, at (1).
- Variety; page 102.
- Venlets; 265.
- Veins; 264.
- Velvety; soft and velvet-like.
- Ventral suture; 453.
- Versatile; 423, at (3).
- Verticil; 349.
- Verticillate; 260, at (3).
- Villosa, Villose; 81, at (5).
- Vine; 234.
- Viscid; clammy, as if covered with some sticky fluid.
- Virgate; long and slender; wand-like.
- Vittæ; Order LVII., page 114.
- Whorl; same as verticil; 349.
- Whorled; same as verticillate; 260 at (3).
- Winged; bordered with a thin, leafy, or membranous expansion; *a. g.*, winged petiole; 335, at (2).
- Woody tissue; 40.
- Woolly; 81, at (7).

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